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PNL-6581 Vol. 1
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Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period January 1 to March 31, 1988

Volume 1 — Text

May 1988

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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PNL-6581 Vol. 1

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS Price Codes
Microfiche A01

Printed Copy

Pages	Price Codes
001-025	A02
026-050	A03
051-075	A04
076-100	A05
101-125	A06
126-150	A07
151-175	A08
176-200	A09
201-225	A010
226-250	A011
251-275	A012
276-300	A013

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UC-41, 11

GROUND-WATER MONITORING COMPLIANCE PROJECTS FOR HANFORD SITE FACILITIES: PROGRESS REPORT FOR THE PERIOD JANUARY 1 TO MARCH 31, 1988

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Pacific Northwest Laboratory
Richland, Washington 99352

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SUMMARY

This report describes the progress of eight Hanford Site ground-water monitoring projects for the period January 1 to March 31, 1988. The facilities represented by the eight projects are the 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 216-A-36B Crib, 1301-N Liquid Waste Disposal Facility, 1325-N Liquid Waste Disposal Facility, and 1324-N/NA Surface Impoundment and Percolation Ponds. The latter four projects are included in this series of quarterly reports for the first time. This report is the seventh in a series of periodic status reports; the first six cover the period from May 1, 1986, through December 31, 1987 (PNL 1986; 1987a,b,c,d; 1988a). This report satisfies the requirements of Section 17B(3) of the Consent Agreement and Compliance Order issued by the Washington State Department of Ecology (1986a) to the U.S. Department of Energy-Richland Operations Office.

The eight projects discussed in this report were designed according to the applicable ground-water monitoring requirements specified in the Resource Conservation and Recovery Act of 1976 and codified in 40 CFR 265 Subpart F (EPA 1984) and in Washington Administrative Code 173-303 (Ecology 1986b).

During the period, field activity at the 300 Area Process Trenches and 183-H Solar Evaporation Basins consisted of scheduled monitoring of liquid levels and collection and analysis of water samples. At the 200 Areas Low-Level Burial Grounds, wells constructed during the previous quarter were further inspected and developed. At the 216-A-36B Crib, five new monitoring wells were initiated, and one of these was completed during this quarter. The results of analysis of water samples collected during well development are presented. Five new monitoring wells were completed in the 100-N Area, and quarterly sampling commenced in December 1987.

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INTRODUCTION

This report describes recent progress on ground-water monitoring projects for eight Hanford Site waste disposal facilities: 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 216-A-36B Crib, 1301-N Liquid Waste Disposal Facility, 1325-N Liquid Waste Disposal Facility, and the 1324-N/NA Surface Impoundment and Percolation Ponds. The reporting period is January 1 to March 31, 1988. These projects were designed according to requirements contained in the Resource Conservation and Recovery Act (RCRA) of 1976, and codified in 40 CFR 265 (EPA 1984) and in Washington Administrative Code (WAC) 173-303 (Ecology 1986b).

Six previous quarterly reports (PNL 1986; 1987a,b,c,d; 1988) have been issued in this series and cover the period from May 1, 1986, to December 31, 1987. This report includes the first calendar quarter of 1988 (January 1 to March 31, 1988), except for the newly added projects (216-A-36B Cribs and the three projects in the 100-N Area). For these, some activities that occurred before the start of 1988 are included.

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300 AREA PROCESS TRENCHES

R. Schalla

The previously issued reports (PNL 1986; 1987a,b,c,d; 1988) contain information on the progress made and the data obtained by the RCRA compliance ground-water monitoring project for the 300 Area Process Trenches during the period from May 1985 through December 1987. This report includes information on subsequent activities and data.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Construction of five new intermediate-depth monitoring wells, which were scheduled to be installed in April 1988, has been postponed until next fiscal year as a result of negotiations between Westinghouse Hanford Company (WHC) and the Washington State Department of Ecology (hereafter called Ecology). Other types of hydrogeologic data collection and analysis activities are discussed in the following subsections.

Hydrogeologic Characterization Effort

Hydrogeologic characterization efforts were limited to work performed by Washington State University and Pacific Northwest Laboratory (PNL) on refinement of the hydrogeologic conceptual model and time-series analysis of surface-water and ground-water data to aid in this year's ground-water modeling effort. Detailed stratigraphic interpretation has been performed to delineate lithostratigraphic units for improving the hydrogeologic conceptual model. Twenty years of daily river flow data from Priest Rapids Dam have been analyzed to generate a statistical description of Columbia River behavior at the 300 Area. The forces that control river flow were investigated to choose the appropriate boundary conditions for the ground-water model of the 300 Area.

Computer programs (e.g., XCOR300) to measure correlations between river stage and ground-water elevations have been developed and tested. Processing of the data logger information has begun to provide insight into the aquifer properties between the wells and the river. The well locations, generalized flow pattern, and layout of the 300 Area and vicinity are shown in Figure 1.

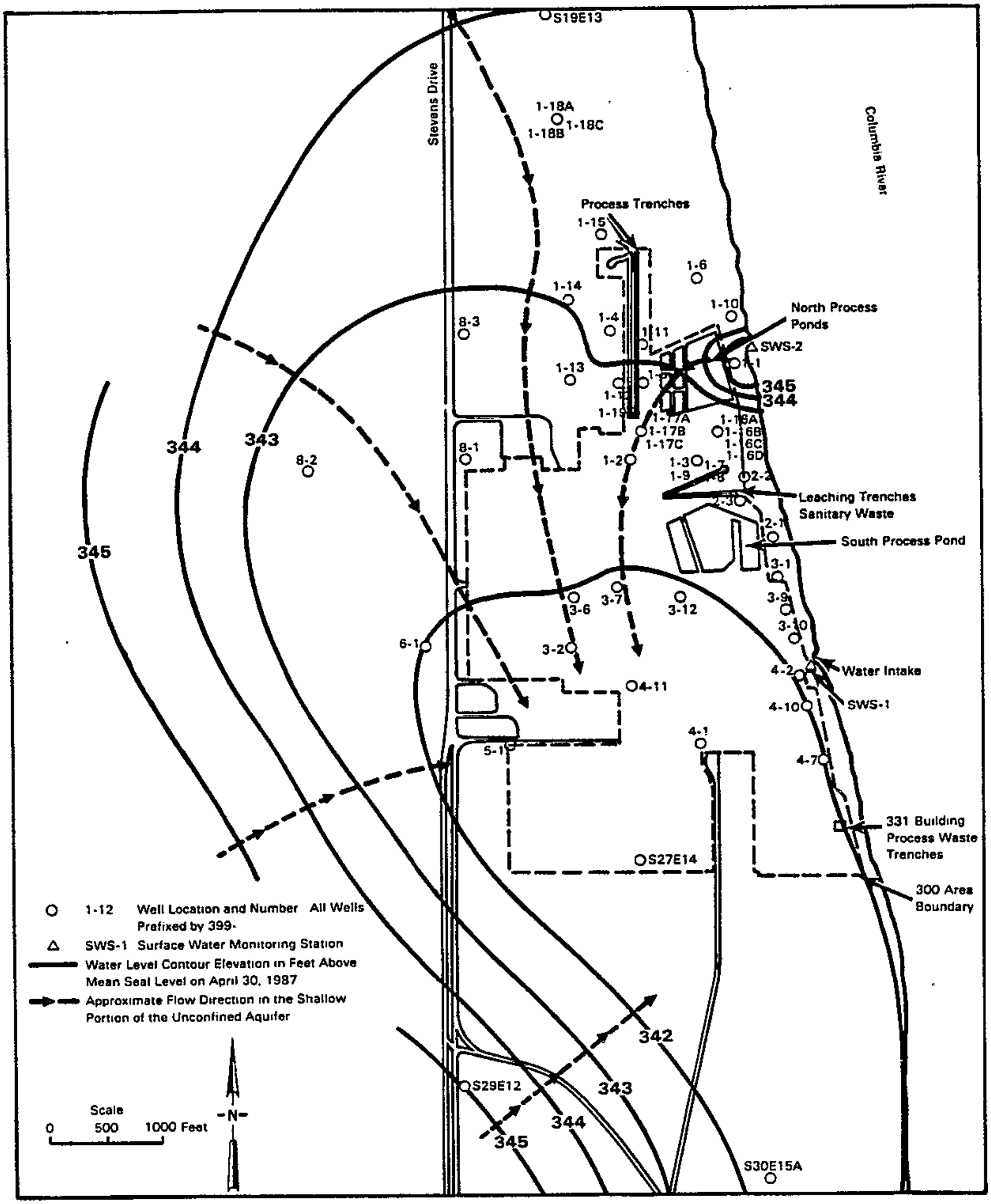

FIGURE 1. Generalized Flow Pattern and Well Locations for the 300 Area and Vicinity

Nonroutine field data collection is not scheduled for this year; however, existing geologic and hydrostratigraphic data are being evaluated for the 300 Area and those areas extending beyond the immediate study area. Routine data collection has included continuous surface-water and ground-water data using data loggers and monthly measurement of water levels in the 49-well network in the 300 Area.

Frequent (i.e., every half hour) water-level monitoring continued successfully at the two surface-water monitoring stations on the Columbia River (shown in Figure 1 as SWS-1 and SWS-2) and in monitoring wells 399-1-10, 399-1-13, 399-1-15, 399-1-16A, and 399-1-18A. The addition of the second, temporary surface-water station provided valuable information on the gradient variations along this reach of the Columbia River. Electrical conductivity (EC) and temperature sensors installed approximately 9 months ago in three wells (i.e., 399-1-10, 399-1-17A, and 399-1-18A) and river station SWS-1 had poor performance and functional reliability; therefore, they have provided limited useful data. Thus far, the sensors have not provided the information for an evaluation of the dynamics, short-term variability, and impact of liquid discharges to the process trenches on the unconfined aquifer or insights into the relationship of changes in river stage and the river water effect on temperature and EC in the ground-water system. Currently, all EC and temperature measurements are made every half hour by data logging systems.

Ground-water modeling work began later this quarter to determine if initial and boundary conditions needed to be expanded, particularly southward for evaluating transient flow and transport from the process trenches. Backups of old files were made for future simulations of the ground-water flow system using the Coupled Fluid, Energy, and Solute Transport (CFEST) code.

Most of the comments on the draft interim characterization report were addressed this quarter. The final version is scheduled for publication next quarter.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Ground water from the 300 Area Process Trenches was sampled this quarter on a weekly basis from three wells adjacent to the process trenches; the analyses are discussed in the following subsection. A discussion of the results is presented later in this section. Raw analytical data for ground-water samples collected from wells in the 300 Area are listed in Table 1.

Collection and Analysis

The quarterly sampling network, which consists of 34 monitoring wells, was not sampled this quarter, but will be sampled in the next quarter.

Three wells (399-1-11, 399-1-17A, and 399-1-19) near the process trenches were sampled weekly for a limited set of specific constituents (i.e., volatile chlorinated hydrocarbons, anions, and uranium). These wells have proven to be adequate locations for monitoring variations in the constituents sampled. Anions were substituted for cations (i.e., metals) in the second weekly sampling in December 1987 because additional weekly information for cations would provide few insights and some anions serve as precursors.

Analyses of field samples by an independent laboratory confirmed the results from the United States Testing Company, Inc. (UST).

Discussion of Results

Analytical data obtained from weekly samples taken in December 1987 and January and February 1988 from wells 399-1-11, 399-1-17A, and 399-1-19 are discussed in the following paragraphs. The results were generally consistent with those obtained previously for these wells. The samples continued to show the presence of uranium, anions, metals, and low concentrations of volatile organics in the ground water near the process trenches.

Uranium concentrations in the three wells near the process trenches rose to a peak and then declined at different times, apparently relative to their proximity to the process trenches, as shown in Figure 2. Specifically, concentrations in well 399-1-11 rose from 54 ppb in the December 3, 1987, sample to 279 ppb in the January 13, 1988, sample and declined in subsequent samples to 127 ppb in the February 18, 1988, sample. Similarly, uranium

TABLE 1. Ground-Water Chemistry Summary for Samples Collected from Wells Near the 300 Area Process Trenches, December 1987 to February 1988

Well name	Collection Date	Duplicate sample number	FBARIUM PPB 1000	FCALCIU PPB .	FCOPPER PPB 1300*	FIRON PPB 300*	FMAGNES PPB .	FMANGAN PPB 50*
3-1-11	03DEC87		19	17,700	24	<30	4,250	<5
3-1-17A	03DEC87		28	20,600	20	<30	4,810	<5
3-1-19	03DEC87		32	23,200	27	83	6,580	7

Well name	Collection Date	Duplicate sample number	FNICKEL PPB .	FPOTASS PPB .	FSODIUM PPB .	FVANADI PPB .	FZINC PPB 5000*
3-1-11	03DEC87		<10	1,800	7,290	<5	10
3-1-17A	03DEC87		<10	2,170	16,600	8	<5
3-1-19	03DEC87		11	1,850	21,200	<5	5

Well name	Collection Date	Duplicate sample number	1,1,1-T PPB 200	CHLFORM PPB 100	CHLORID PPB 250000*	CONDFLD UMHO 700*	FLUORID PPB 4000	METHYCH PPB .	NITRATE PPB 45000
3-1-11	03DEC87		<5	12	.	136	.	<10	.
	09DEC87		<5	11	32,800	209	<500	<10	2,060
	18DEC87		<5	13	9,070	147	<500	<10	2,010
	30DEC87		<5	9	14,300	169	<500	<10	1,800
	07JAN88		<5	11	15,600	M	<500	#1	3,590
	13JAN88		<5	12	28,000	190	<500	<10	2,290
	20JAN88		<5	12	20,200	219	<500	#8	2,770
	28JAN88		<5	10	35,400	233	<500	<10	2,400
	05FEB88		<5	13	5,070	140	<500	<10	2,000
	11FEB88		<5	12	10,600	134	<500	<10	3,040
	18FEB88		<5	<5	3,550	164	<500	<10	1,880
	26FEB88		#4	11	26,600	180	<500	<10	1,990
3-1-17A	03DEC87		<5	12	.	217	.	<10	.
	09DEC87		<5	11	46,500	259	<500	#2	1,970
	18DEC87		<5	11	52,700	260	507	#2	2,060
	30DEC87		<5	12	30,800	208	526	<10	1,730
	07JAN88		<5	12	38,300	M	<500	<10	2,330
	13JAN88		<5	13	26,600	205	537	<10	2,950
	20JAN88		<5	11	20,700	210	<500	<10	2,790
	28JAN88		<5	10	34,700	260	522	<10	2,930
	05FEB88		<5	10	27,200	211	<500	<10	2,580
	11FEB88		<5	9	25,500	161	<500	<10	2,370
	18FEB88		<5	10	22,900	206	<500	<10	2,490
	26FEB88		8	10	29,000	187	<500	<10	2,320
3-1-19	03DEC87		<5	11	.	258	.	<10	.
	09DEC87		<5	11	122,000	438	543	<10	1,770
	18DEC87		<5	14	67,700	305	503	<10	1,610
	30DEC87		<5	11	77,200	347	620	#2	1,610
	07JAN88		<5	12	33,800	M	<500	<10	2,280
	13JAN88		<5	12	32,700	233	526	<10	2,780
	20JAN88		<5	11	22,900	225	<500	<10	2,690
	28JAN88		<5	10	39,000	244	<500	<10	3,120
	05FEB88		<5	10	26,000	209	<500	<10	2,300
	18FEB88		<5	10	18,300	198	<500	<10	2,230
	26FEB88		5	10	26,900	181	<500	<10	2,290

TABLE 1. (contd)

Well name	Collection Date	Duplicate sample number	PERCENE PPB .	PHFIELD .	SULFATE PPB 250000*	TRANDCE PPB 70*	TRICENE PPB 5	U-CHEM UG/L .
3-1-11	03DEC87		<5	6.8	.	.	<5	54.2
	09DEC87		<5	7.0	15,000	.	<5	60.6
	18DEC87		<5	7.2	13,500	.	<5	61.4
	30DEC87		<5	6.6	13,700	.	<5	76.6
	07JAN88		<5	8.0	15,600	.	<5	152.0
	13JAN88		<5	7.4	16,200	.	<5	279.0
	20JAN88		<5	7.5	15,900	.	<5	174.0
	28JAN88		<5	7.4	18,100	.	<5	149.0
	05FEB88		<5	7.3	17,200	.	<5	119.0
	11FEB88		<5	7.9	17,900	.	<5	136.0
	18FEB88		<5	7.7	18,500	.	<5	127.0
	26FEB88		<5	8.1	20,400	.	<5	102.0
3-1-17A	03DEC87		#1	6.7	.	.	<5	66.7
	09DEC87		#1	6.7	16,300	.	<5	59.0
	18DEC87		<5	6.9	14,600	.	<5	103.0
	30DEC87		<5	6.4	13,900	.	<5	88.2
	07JAN88		<5	7.4	15,200	.	<5	118.0
	13JAN88		<5	7.3	15,200	.	<5	97.9
	20JAN88		<5	7.1	14,200	.	<5	115.0
	28JAN88		<5	7.7	17,700	.	<5	120.0
	05FEB88		<5	7.1	17,000	.	<5	192.0
	11FEB88		<5	7.5	17,500	.	<5	145.0
	18FEB88		<5	7.4	18,000	.	<5	152.0
	26FEB88		<5	7.7	18,800	.	<5	153.0
3-1-19	03DEC87		#2	6.9	.	.	<5	271.0
	09DEC87		#2	6.8	17,500	.	#2	262.0
	18DEC87		#2	7.0	14,000	#2	#3	228.0
	30DEC87		#1	6.5	15,700	#1	#1	446.0
	07JAN88		#1	7.9	14,800	#1	#2	247.0
	13JAN88		#1	8.2	15,200	#2	#3	290.0
	20JAN88		<5	7.5	14,200	.	<5	218.0
	28JAN88		#4	7.1	17,300	#3	<5	231.0
	05FEB88		<5	7.2	16,700	.	<5	234.0
	18FEB88		<5	7.4	18,100	.	<5	224.0
	26FEB88		<5	7.7	19,200	.	<5	303.0

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable

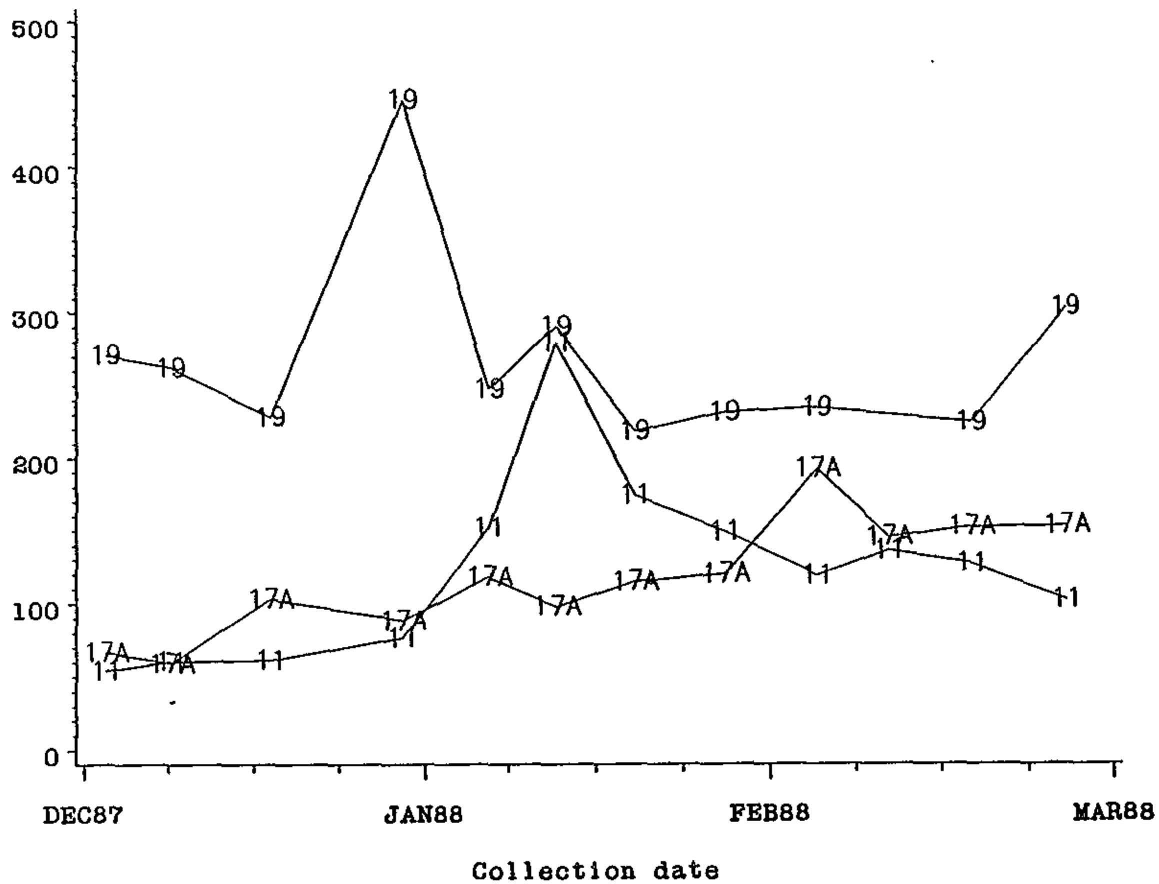

FIGURE 2. Concentrations of Uranium (ppb) in Wells 399-1-11, 399-1-17A, and 399-1-19 for December 1987 Through February 1988 (plotting symbols are abbreviations of the well name, concentrations below detection are plotted as zero)

concentrations in well 399-1-17A increased from 67 ppb in the December 3 sample to 192 ppb in the February 5, 1988, sample and declined to 152 ppb in the February 18 sample. Concentrations in well 399-1-19 reached a maximum of 446 ppb in the December 30, 1987, sample (up from 271 ppb in the December 3 sample) and declined to 224 ppb in the February 18 sample.

Several volatile organic compounds were detected sporadically in all three wells at concentrations less than the laboratory's detection limits. The maximum contaminant levels (MCL) for each compound were not exceeded during any of the sampling periods this quarter. Methylene chloride (detection limit is contractually guaranteed at 10 ppb) was detected in the January 7 and 20, 1988, samples from well 399-1-11 in concentrations of 1 and 8 ppb, respectively (Figure 3). Methylene chloride concentrations of 2 ppb were detected in the December 9 and 18 samples from well 399-1-17A and in the December 30 sample from well 399-1-19. Only the February 26 samples from all three wells contained 1,1,1-trichloromethane (1,1,1-T) at or near the contractual detection limit of 5 ppb. The specific concentrations of 1,1,1-T were 4 ppb in well 399-1-11, 6 ppb in well 399-1-17A, and 5 ppb in well 399-1-19. The MCL for 1,1,1-T is 200 ppb. Samples taken in December and January from well 399-1-19 contained 1 to 4 ppb of perchloroethylene (PCE; detection limit is 5 ppb), 1 to 3 ppb of 1,2-dichloroethylene (DCE; detection limit is 10 ppb), and 1 to 3 ppb of trichloroethylene (TCE; detection limit is 5 ppb) (see Figure 4). The MCL for TCE is 5 ppb and the proposed MCL for DCE is 70 ppb. There is no MCL for PCE. Perchloroethylene was also detected in a concentration of 1 ppb in the December 3 and 9 samples from well 399-1-17A.

All results obtained for samples collected during December 1987 and January and February 1988 are summarized in Table 2.

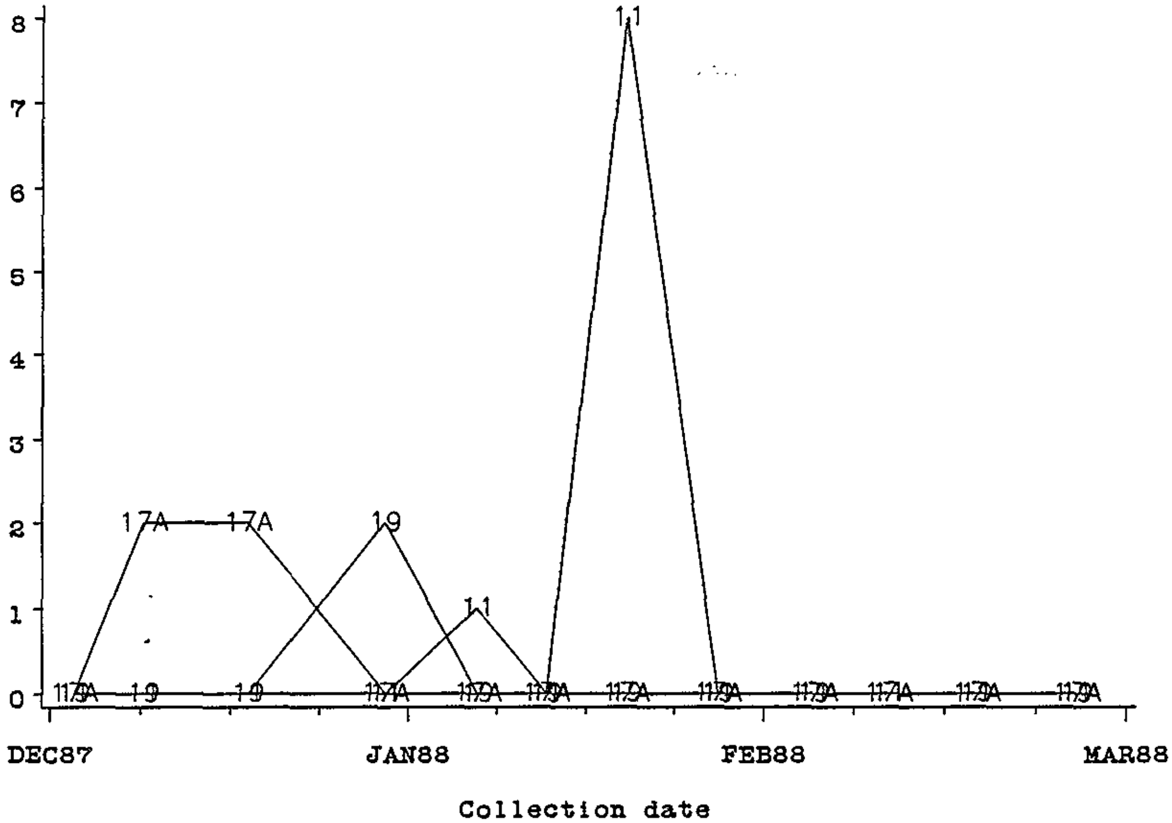

FIGURE 3. Concentrations of Methylene Chloride (ppb) in Wells 399-1-11, 399-1-17A, and 399-1-19 for December 1987 Through February 1988 (plotting symbols are abbreviations of the well name, concentrations below detection are plotted as zero)

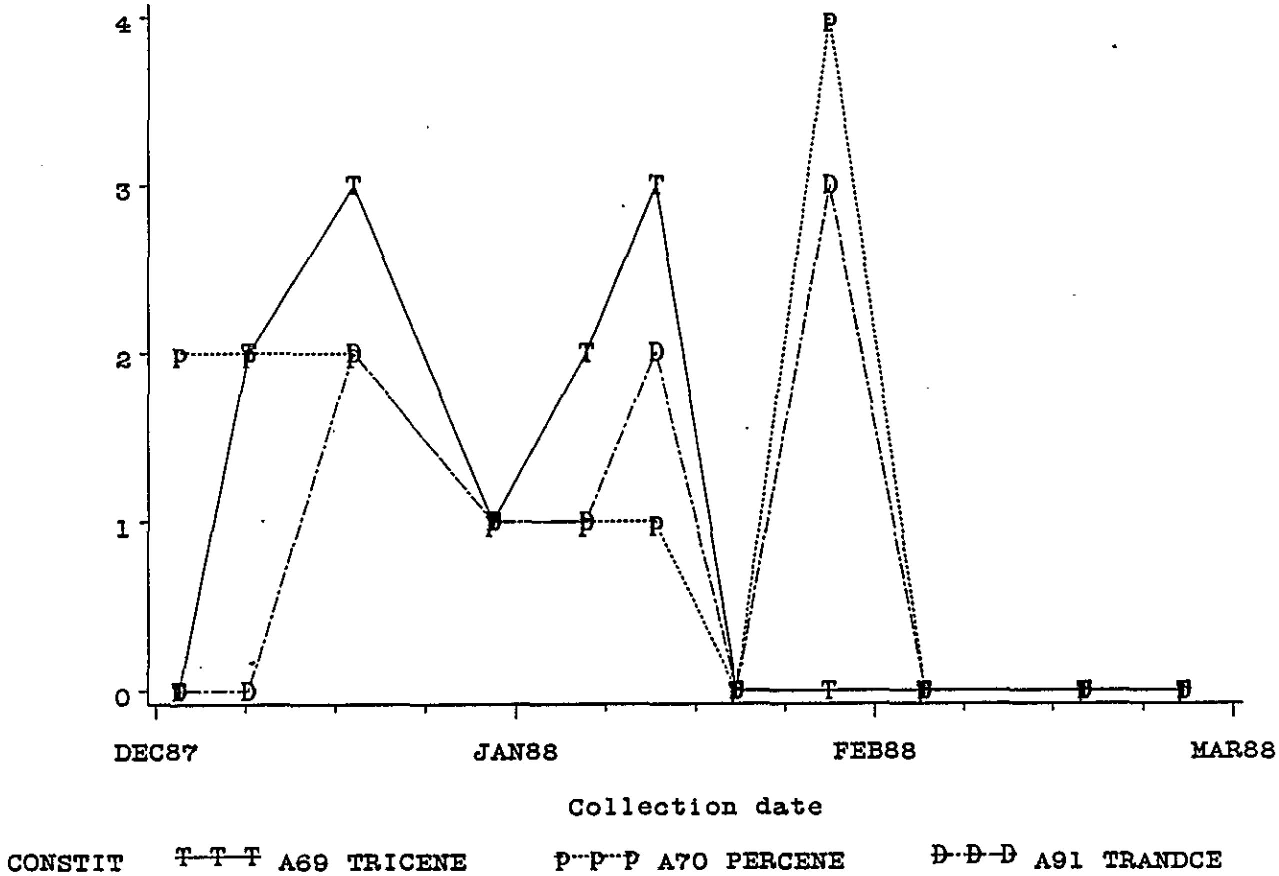

FIGURE 4. Concentrations of Chlorinated Ethenes (ppb) in Well 399-1-19 for December 1987 Through February 1988 (concentrations below detection are plotted as zero)

TABLE 2. Sampling Summary for the 300 Area Process Trenches, December 1987 to February 1988

---------- Constituent List=Contamination Indicators ----------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Limits Limit	Agency	Exceeded	Full name
191	CONDFLD	UMHO	1	32	0	700	WACS		Specific conductance, field
199	PHFIELD		0.1	35	0	6.5-8.5	EPAS	xxx	pH, field

---------- Constituent List=Drinking Water Standards ----------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Limits Limit	Agency	Exceeded	Full name
A61	TETRANE	PPB	5	35	35 ***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A67	1,1,1-T	PPB	5	35	32	200	EPA		1,1,1-trichloroethane
A69	TRICENE	PPB	5	35	30	5	EPA		Trichloroethylene [1,1,2-trichloroethene
A80	CHLFORM	PPB	5	35	1	100	EPA		Chloroform [Trichloromethane]
C72	NITRATE	PPB	500	32	0	45000	EPA		Nitrate
C74	FLUORID	PPB	500	32	24	4000	EPA		Fluoride
H20	FBARIUM	PPB	6	3	0	1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	3	3 ***	10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	3	3 ***	50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	3	3 ***	50	EPA		Silver, filtered

---------- Constituent List=Quality Characteristics ----------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Limits Limit	Agency	Exceeded	Full name
C73	SULFATE	PPB	500	32	0	250000	EPAS		Sulfate
C75	CHLORID	PPB	500	32	0	250000	EPAS		Chloride
H24	FSODIUM	PPB	200	3	0				Sodium, filtered
H29	FMANGAN	PPB	5	3	2	50	EPAS		Manganese, filtered
H31	FIRON	PPB	30	3	2	300	EPAS		Iron, filtered

TABLE 2. (contd)

Constituent List=Site Specific

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
124	U-CHEM	UG/L	0.725	35	0		.			Natural uranium
A64	METHONE	PPB	10	35	35	***	.			Methyl ethyl ketone
A68	1,1,2-T	PPB	5	35	35	***	.			1,1,2-trichloroethane
A70	PERCENE	PPB	5	35	28		.			Perchloroethylene
A71	OPXYLE	PPB	5	35	35	***	440	EPAP		Xylene-o,p
A91	TRANDCE	PPB	10	5	0		70	EPAP		Trans-1,2-dichloroethene
A93	METHYCH	PPB	10	35	30		.			Methylene chloride
B14	M-XYLE	PPB	5	35	35	***	440	EPAP		Xylene-m
C76	PHOSPHA	PPB	1000	32	32	***	.			Phosphate
H18	FZINC	PPB	5	3	1		5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	3	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	3	2		.			Nickel, filtered
H26	FCOPPER	PPB	10	3	0		1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	3	2		.			Vanadium, filtered
H28	FALUMIN	PPB	150	3	3	***	.			Aluminum, filtered
H30	FPOTASS	PPB	100	3	0		.			Potassium, filtered
H32	FMAGNES	PPB	50	3	0		.			Magnesium, filtered
H68	HEXONE	PPB	10	35	35	***	.			Hexone

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986)
National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

183-H SOLAR EVAPORATION BASINS

T. L. Liikala

Work described in the previous quarterly report (PNL 1988) focused on installation of locks on the monitoring wells, replacement of concrete pads at two wells, preparations for installing a permanent river stage recorder, and routine monitoring of the ground water. This section focuses on subsequent activities and data collected from January 1 to March 31, 1988.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Casing elevations for wells 199-H3-1 and 199-H3-2A were resurveyed by Kaiser Engineers Hanford (KEH) after having the concrete pads replaced. No changes in elevation occurred. These replacements were necessary because a large crack existed in the pad at well 199-H3-1, and the ground surface had apparently been eroded from beneath the pad at well 199-H3-2A.

Hydrogeologic Characterization Effort

The Cultural Resources organization of PNL completed a field survey of the proposed 100-H Area river stage recorder site. No archaeological, historic, paleontological, or Native American resources were encountered; therefore, clearance for construction was granted.

Applications for the proposed recorder site to the U.S. Department of the Army and Washington State Department of Fisheries (WSDOF) were completed and submitted to the U.S. Department of Energy-Richland Operations Office (DOE-RL) on February 24, 1988. A site inspection was performed by the WSDOF on March 23, 1988, and construction of the river stage recorder is tentatively scheduled to be completed between August 1 to 31, 1988. The WSDOF requested that all construction using a backhoe be performed from the shore during low-water periods. Under the supervision of PNL, KEH will construct the river stage recorder during low-water periods. The Grant County Public Utility District at Priest Rapids Dam will advise PNL when these low-water periods will be scheduled.

Preparation of Section E of the Final Status Post-Closure Permit Application for the 183-H Solar Evaporation Basins was completed on March 16, 1988. Preparation of Section E impacted the completion schedule for the final characterization report. The final report is now scheduled for completion on June 30, 1988.

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

The ground water around the 183-H basins has been sampled and analyzed routinely since June 1985. The results of ground-water monitoring activities for this quarter are discussed in this section.

Collection and Analysis

Twenty-three wells were sampled in December 1987 and 10 wells were sampled in both January and February 1988. Wells 199-H3-1, 199-H3-2A, 199-H3-2B, 199-H3-2C, 199-H4-5, 199-H4-6, 199-H4-7, 199-H4-8, 199-H4-10, 199-H4-13, 199-H4-14, 199-H4-15A, and 199-H4-15B were reduced to quarterly sampling because they have been sampled monthly for at least 1 year and are located outside the main ground-water contamination plume attributed to the 183-H basins. The remaining wells, 199-H4-3, 199-H4-4, 199-H4-9, 199-H4-11, 199-H4-12A, 199-H4-12B, 199-H4-12C, 199-H4-16, 199-H4-17, and 199-H4-18, continue to be sampled on a monthly basis.

Purge water from the 100-H Area wells continues to be discharged into galvanized storage drums and disposed of in the 200 Areas tank farms. This process reduced sampling efficiency from an average of four to three wells per day.

The bladder and submersible pumps in well 199-H3-1 were replaced with a Hydrostar®[(a)] sampling pump on March 10, 1988. The bladder apparently ruptured and the submersible pump was not functioning properly. A new support plate and locking well cap were installed on this well.

(a) ®Hydrostar is a registered tradename of Instrumentation Northwest, Redmond, Washington.

Discussion of Results

All sample analyses for the period from December 1987 through February 1988 are summarized in Table 3. Table 4 contains the analytical data for constituents that were found to be above detection limits in at least one analysis.

As reported previously, concentrations of filtered zinc, ranging from 184 to 1400 ppb, were reported for wells 199-H4-3, 199-H4-10, and 199-H4-12C in October 1987. It was suspected that zinc may have been leaching from the filters used during sampling. Five randomly selected filters were tested for leaching using 100 mL of distilled water. Results were below detection for all of the filters. Zinc was not detected in subsequent resampling of these wells. The original UST samples will be reanalyzed by PNL.

As reported previously, field pH measurements do not correspond to the laboratory pH values. Similar results have been reported on other RCRA projects conducted by PNL. Therefore, blind pH standards were submitted for the March sampling period. In addition, a field study of pH changes over time will be conducted at the Solid Waste Landfill.

In December 1987, methylene chloride concentrations of 81 and 49 ppb were reported in wells 199-H3-1 and 199-H4-17, respectively. These elevated concentrations continue to be random both in time and well location.

As shown in Figure 5, concentrations of phosphate, ranging from 6240 to 13,100 ppb were reported in wells 199-H4-3 (Figure 5a), 199-H4-4, and 199-H4-9 (Figure 5b) in December 1987 and January 1988. Results from all other wells sampled in December, January, and February were below detection. Phosphate has not previously been reported above the 1000-ppb detection limit for any wells in the network. Phosphate was not detected in subsequent resampling of these wells. The original UST samples will be reanalyzed by PNL.

A gross beta concentration of 103 pCi/L was reported in well 199-H4-11 in January 1988. This is the maximum concentration reported to date for this well.

TABLE 3. Ground-Water Chemistry Summary for Samples Collected from Wells Near the 183-H Solar Evaporation Basins, December 1987 to February 1988

Constituent List=Contamination Indicators

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits: Limit	Agency	Exceeded	Full name
191	CONDFLD	UMHO	1	39	0		700	WACS	xxx	Specific conductance, field
199	PHFIELD		0.1	39	0		6.5-8.5	EPAS	xxx	pH, field
207	PH-LAB		0.01	39	0		6.5-8.5	EPAS		pH, laboratory
C68	TOX	PPB	100	39	0		.			Total organic halogen
C69	TOC	PPB	1000	39	0		.			Total organic carbon

Constituent List=Drinking Water Standards

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits: Limit	Agency	Exceeded	Full name
010	CO 60	PCI/L	22.5	2	0		100	EPA		Cobalt-60
024	CS-137	PCI/L	20	2	0		200	EPA		Cesium-137
034	RU 106	PCI/L	172.5	2	0		30	EPA		Ruthenium-106
109	COLIFRM	MPN	2.2	39	39	***	1	EPA		Coliform bacteria
111	BETA	PCI/L	8	43	0		50	EPA	xxx	Gross beta
121	SR 90	PCI/L	5	2	0		8	EPA		Strontium-90
181	RADIUM	PCI/L	1	40	0		5	EPA		Total radium
212	ALPHA	PCI/L	4	43	0		15	EPA	xxx	Gross alpha
A06	BARIUM	PPB	6	39	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	39	37		10	EPA		Cadmium
A08	CHROMUM	PPB	10	39	0		50	EPA	xxx	Chromium
A10	SILVER	PPB	10	39	39	***	50	EPA		Silver
A20	ARSENIC	PPB	5	39	31		50	EPA		Arsenic
A21	MERCURY	PPB	0.1	39	39	***	2	EPA		Mercury
A22	SELENUM	PPB	5	39	39	***	10	EPA		Selenium
A33	ENDRIN	PPB	0.1	19	19	***	0.2	EPA		Endrin
A34	METHLOR	PPB	3	19	19	***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	19	19	***	5	EPA		Toxaphene
A36	a-BHC	PPB	0.1	19	19	***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	0.1	19	19	***	4	EPA		Beta-BHC
A38	g-BHC	PPB	0.1	19	19	***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	0.1	19	19	***	4	EPA		Delta-BHC
A51	LEADGF	PPB	5	39	35		50	EPA	xxx	Lead (graphite furnace)
A61	TETRANE	PPB	5	44	44	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	PPB	5	2	2	***	5	EPA		Benzene
A67	1,1,1-T	PPB	5	44	43		200	EPA		1,1,1-trichloroethane
A69	TRICENE	PPB	5	44	44	***	5	EPA		Trichloroethylene [1,1,2-trichloroethene
A90	1,2-DIC	PPB	10	2	2	***	5	EPA		1,2-dichloroethane
A92	DICETHY	PPB	10	2	2	***	7	EPA		1,1-dichloroethylene
B08	BROMORM	PPB	10	2	2	***	100	EPA		Bromoform [Tribromomethane]
B13	VINYIDE	PPB	10	2	2	***	2	EPA		Vinyl chloride
C72	NITRATE	PPB	500	44	0		45000	EPA	xxx	Nitrate
C74	FLUORID	PPB	500	44	30		4000	EPA		Fluoride
H13	2,4-D	PPB	2	19	19	***	100	EPA		2,4-D [Dichlorophenoxyacetic acid]
H14	2,4,5TP	PPB	2	19	19	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	44	2		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	44	42		10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	44	2		50	EPA	xxx	Chromium, filtered
H23	FSILVER	PPB	10	44	44	***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	40	30		50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	0.1	39	39	***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	40	40	***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	40	40	***	50	EPA		Lead, filtered

TABLE 3. (contd)

Constituent List=Quality Characteristics

Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits: Limit	Agency	Exceeded	Full name
A11	SODIUM	PPB	200	39	0		.			Sodium
A17	MANGESE	PPB	5	39	24		50	EPAS	xxx	Manganese
A19	IRON	PPB	30	39	9		300	EPAS	xxx	Iron
C57	PHENOL	PPB	10	2	2	***	.			Phenol
C73	SULFATE	PPB	500	44	0		250000	EPAS		Sulfate
C75	CHLORID	PPB	500	44	0		250000	EPAS		Chloride
H24	FSODIUM	PPB	200	44	0		.			Sodium, filtered
H29	FMANGAN	PPB	5	44	40		50	EPAS	xxx	Manganese, filtered
H31	FIRON	PPB	30	44	37		300	EPAS		Iron, filtered
H57	LPHENOL	PPB	10	17	17	***	.			Phenol, low DL

Constituent List=Site Specific

Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits: Limit	Agency	Exceeded	Full name
124	U-CHEM	UG/L	0.725	2	0					Natural uranium
A01	BERYLUM	PPB	5	39	39	***	.			Beryllium
A03	STRONUM	PPB	20	39	0		.			Strontium
A04	ZINC	PPB	5	39	8		5000	EPAS		Zinc
A05	CALCIUM	PPB	50	39	0		.			Calcium
A12	NICKEL	PPB	10	39	30		.			Nickel
A13	COPPER	PPB	10	39	30		1300	EPAP		Copper
A14	VANADUM	PPB	5	39	29		.			Vanadium
A15	ANTIONY	PPB	100	39	39	***	.			Antimony
A16	ALUMNUM	PPB	150	39	35		.			Aluminum
A18	POTASUM	PPB	100	39	0		.			Potassium
A50	MAGNES	PPB	50	39	0		.			Magnesium
A64	METHONE	PPB	10	44	44	***	.			Methyl ethyl ketone
A68	1,1,2-T	PPB	5	44	44	***	.			1,1,2-trichloroethane
A70	PERCENE	PPB	5	44	42		.			Perchloroethylene
A71	OPXYLE	PPB	5	44	44	***	440	EPAP		Xylene-o,p
A80	CHLFORM	PPB	5	44	0		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	PPB	10	44	38		.			Methylene chloride
B14	M-XYLE	PPB	5	44	44	***	440	EPAP		Xylene-m
C76	PHOSPHA	PPB	1000	44	34		.			Phosphate
C80	AMMONIU	PPB	50	44	42		.			Ammonium ion
H16	TC	PPB	1000	39	0		.			Total carbon
H17	TDS	PPB	5000	39	0		500000	EPAS	xxx	Total dissolved solids
H18	FZINC	PPB	5	44	23		5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	44	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	44	37		.			Nickel, filtered
H26	FCOPPER	PPB	10	44	43		1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	44	25		.			Vanadium, filtered
H28	FALUMIN	PPB	150	44	44	***	.			Aluminum, filtered
H30	FPOTASS	PPB	100	44	0		.			Potassium, filtered
H32	FMAGNES	PPB	50	44	0		.			Magnesium, filtered
H33	FBERYLL	PPB	5	44	44	***	.			Beryllium, filtered
H35	FSTRONT	PPB	20	44	0		.			Strontium, filtered
H36	FANTIMO	PPB	100	44	44	***	.			Antimony, filtered
H88	HEXONE	PPB	10	44	44	***	.			Hexone

TABLE 3. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A23	THALIUM	PPB	5	2	2	***	.			Thallium
A24	THIOURA	PPB	200	2	2	***	.			Thiourea
A25	ACETREA	PPB	200	2	2	***	.			1-acetyl-2-thiourea
A26	CHLOREA	PPB	200	2	2	***	.			1-(o-chlorophenyl) thiourea
A27	DIETROL	PPB	200	2	2	***	.			Diethylstilbesterol
A28	ETHYREA	PPB	200	2	2	***	.			Ethylenethiourea
A29	NAPHREA	PPB	200	2	2	***	.			1-naphthyl-2-thiourea
A32	PHENREA	PPB	500	2	2	***	.			N-phenylthiourea
A40	DDD	PPB	0.1	2	2	***	.			DDD
A41	DDE	PPB	0.1	2	2	***	.			DDE
A42	DDT	PPB	0.1	2	2	***	.			DDT
A43	HEPTLOR	PPB	0.1	2	2	***	0	EPAP		Heptachlor
A44	HEPTIDE	PPB	0.1	2	2	***	0	EPAP		Heptachlor epoxide
A46	DIELRIN	PPB	0.1	2	2	***	.			Dieldrin
A47	ALDRIN	PPB	0.1	2	2	***	.			Aldrin
A48	CHLOANE	PPB	1	2	2	***	0	EPAP		Chlordane
A49	ENDO1	PPB	0.1	2	2	***	.			Endosulfan I (alpha)
A52	ENDO2	PPB	0.1	2	2	***	.			Endosulfan II (beta)
A63	DIOXANE	PPB	500	2	2	***	.			Dioxane
A65	PYRIDIN	PPB	500	2	2	***	.			Pyridine
A66	TOLUENE	PPB	5	2	2	***	2000	EPAP		Toluene
A72	ACROLIN	PPB	10	2	2	***	.			Acrolein
A73	ACRYILE	PPB	10	2	2	***	.			Acrylonitrile
A74	BISTHER	PPB	10	2	2	***	.			Bis(chloromethyl) ether
A75	BROMONE	PPB	10	2	2	***	.			Bromoacetone
A76	METHBRO	PPB	10	2	2	***	.			Methyl bromide
A77	CARBIDE	PPB	10	2	2	***	.			Carbon disulfide
A78	CHLBENZ	PPB	10	2	2	***	60	EPAP		Chlorobenzene
A79	CHLTHER	PPB	10	2	2	***	.			2-chloroethyl vinyl ether
A81	METHCHL	PPB	10	2	2	***	.			Methyl chloride [Chloromethane]
A82	CHMTHER	PPB	10	2	2	***	.			Chloromethyl methyl ether
A83	CROTONA	PPB	10	2	2	***	.			Crotonaldehyde
A84	DIBRCHL	PPB	10	2	2	***	0	EPAP		1,2-dibromo-3-chloropropane
A85	DIBRETH	PPB	10	2	2	***	.			1,2-dibromoethane
A86	DIBRMET	PPB	10	2	2	***	.			Dibromomethane
A87	DIBUTEN	PPB	10	2	2	***	.			1,4-dichloro-2-butene
A88	DICDIFM	PPB	10	2	2	***	.			Dichlorodifluoromethane
A89	1,1-DIC	PPB	10	2	2	***	.			1,1-dichloroethane
A91	TRANDCE	PPB	10	2	2	***	70	EPAP		Trans-1,2-dichloroethene
A94	DICPANE	PPB	10	2	2	***	6	EPAP		1,2-dichloropropane
A95	DICPENE	PPB	10	2	2	***	.			1,3-dichloropropene
A96	NNDIEHY	PPB	10	2	2	***	.			N,N-diethylhydrazine
A99	HYDRSUL	PPB	10	2	2	***	.			Hydrogen sulfide
B01	IODOMET	PPB	10	2	2	***	.			Iodomethane
B02	METHACR	PPB	10	2	2	***	.			Methacrylonitrile
B03	METHTHI	PPB	10	2	2	***	.			Methanethiol
B04	PENTACH	PPB	10	2	2	***	.			Pentachloroethane
B05	1112-tc	PPB	10	2	2	***	.			1,1,1,2-tetrachlorethane
B06	1122-tc	PPB	10	2	2	***	.			1,1,2,2-tetrachlorethane

TABLE 3. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
B09	TRCMEOL	PPB	10	2	2	***	.			Trichloromethanethiol
B10	TRCMFLM	PPB	10	2	2	***	.			Trichloromonofluoromethane
B11	TRCPANE	PPB	10	2	2	***	.			Trichloropropane
B12	123-trp	PPB	10	2	2	***	.			1,2,3-trichloropropane
B15	DIETHY	PPB	10	2	2	***	.			Diethylarsine
B19	ACETILE	PPB	3000	2	2	***	.			Acetonitrile
B20	ACETOPH	PPB	10	2	2	***	.			Acetophenone
B21	WARFRIN	PPB	10	2	2	***	.			Warfarin
B22	ACEFENE	PPB	10	2	2	***	.			2-acetylaminofluorene
B23	AMINOYL	PPB	10	2	2	***	.			4-aminobyphenyl
B24	AMIISOX	PPB	10	2	2	***	.			5-(aminomethyl)-3-isoxazolol
B25	AMITROL	PPB	10	2	2	***	.			Amitrole
B26	ANILINE	PPB	10	2	2	***	.			Aniline
B27	ARAMITE	PPB	10	2	2	***	.			Aramite
B28	AURAMIN	PPB	10	2	2	***	.			Auramine
B29	BENZCAC	PPB	10	2	2	***	.			Benz[c]acridine
B30	BENZAAN	PPB	10	2	2	***	.			Benz[a]anthracene
B31	BENDICM	PPB	10	2	2	***	.			Benzene, dichloromethyl
B32	BENTHOL	PPB	10	2	2	***	.			Benzenethoil
B33	BENDINE	PPB	10	2	2	***	.			Benzidine
B34	BENZBFL	PPB	10	2	2	***	.			Benzo[b]fluoranthene
B35	BENZJFL	PPB	10	2	2	***	.			Benzo[j]fluoranthene
B36	PBENZQU	PPB	10	2	2	***	.			P benzoquinone
B37	BENZCHL	PPB	10	2	2	***	.			Benzyl chloride
B38	BIS2CHM	PPB	10	2	2	***	.			Bis(2-chloroethoxy) methane
B39	BIS2CHE	PPB	10	2	2	***	.			Bis(2-chloroethyl) ether
B40	BIS2EPH	PPB	10	2	2	***	.			Bis(2-ethylhexyl) phthalate
B41	BROPHEN	PPB	10	2	2	***	.			4-bromophenyl phenyl ether
B42	BUTBENP	PPB	10	2	2	***	.			Butyl benzyl phthalate
B43	BUTDINP	PPB	10	2	2	***	.			2-sec-butyl-4,6-dinitrophenol
B44	CHALETH	PPB	10	2	2	***	.			Chloroalkyl ethers
B45	CHLANIL	PPB	10	2	2	***	.			P-chloroaniline
B46	CHLCRES	PPB	10	2	2	***	.			P-chloro-m-cresol
B47	CHLEPOX	PPB	10	2	2	***	0	EPAP		1-chloro-2,3-epoxypropane
B48	CHLNAPH	PPB	10	2	2	***	.			2-chloronaphthalene
B49	CHLPHEN	PPB	10	2	2	***	.			2-chlorophenol
B50	CHRYSEN	PPB	10	2	2	***	.			Chrysene
B51	CRESOLS	PPB	10	2	2	***	.			Cresols
B52	CYCHDIN	PPB	10	2	2	***	.			2-cyclohexyl-4,6-dinitrophenol
B53	DIBAHAC	PPB	10	2	2	***	.			Dibenz[a,h]acridine
B54	DIBAJAC	PPB	10	2	2	***	.			Dibenz[a,j]acridine
B55	DIBAHAN	PPB	10	2	2	***	.			Dibenz[a,h]anthracene
B56	DIBCGCA	PPB	10	2	2	***	.			7H-dibenzo[c,g]carbazole
B57	DIBAEPY	PPB	10	2	2	***	.			Dibenzo[a,e]pyrene
B58	DIBAHPY	PPB	10	2	2	***	.			Dibenzo[a,h]pyrene
B59	DIBAIPY	PPB	10	2	2	***	.			Dibenzo[a,i]pyrene
B60	DIBPHTH	PPB	10	2	2	***	.			Di-n-butyl phthalate
B61	12-dben	PPB	10	2	2	***	.			1,2-dichlorobenzene
B62	13-dben	PPB	10	2	2	***	.			1,3-dichlorobenzene
B63	14-dben	PPB	10	2	2	***	.			1,4-dichlorobenzene

TABLE 3. (contd)

Constituent List=WAC 173-303-9905

Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
B64	DICHBEN	PPB	20	2	2	***	.			3,3'-dichlorobenzidine
B65	24-dchp	PPB	10	2	2	***	.			2,4-dichlorophenol
B66	26-dchp	PPB	10	2	2	***	.			2,6-dichlorophenol
B67	DIEPHTH	PPB	10	2	2	***	.			Diethyl phthalate
B68	DIHYSAF	PPB	10	2	2	***	.			Dihydrosafrole
B69	DIMETHB	PPB	10	2	2	***	.			3,3'-dimethoxybenzidine
B70	DIMEAMB	PPB	10	2	2	***	.			P-dimethylaminoazobenzene
B71	DIMBENZ	PPB	10	2	2	***	.			7,12-dimethylbenz[a]anthracene
B72	DIMEYLB	PPB	10	2	2	***	.			3,3'-dimethylbenzidine
B73	THIONOX	PPB	10	2	2	***	.			Thiofanox
B74	DIMPHAM	PPB	10	2	2	***	.			Alpha,alpha-dimethylphenethylamine
B75	DIMPHEN	PPB	10	2	2	***	.			2,4-dimethylphenol
B76	DIMPHTH	PPB	10	2	2	***	.			Dimethyl phthalate
B77	DINBENZ	PPB	10	2	2	***	.			Dinitrobenzene
B78	DINCRES	PPB	10	2	2	***	.			4,6-dinitro-o-cresol and salts
B79	DINPHEN	PPB	50	2	2	***	.			2,4-dinitrophenol
B80	24-dint	PPB	10	2	2	***	.			2,4-dinitrotoluene
B81	26-dint	PPB	10	2	2	***	.			2,6-dinitrotoluene
B82	DIOPHTH	PPB	10	2	2	***	.			Di-n-octyl phthalate
B83	DIPHAMI	PPB	10	2	2	***	.			Diphenylamine
B84	DIPHHYD	PPB	10	2	2	***	.			1,2-diphenylhydrazine
B85	DIPRNIT	PPB	10	2	2	***	.			Di-n-propylnitrosamine
B86	ETHMINE	PPB	10	2	2	***	.			Ethyleneimine
B87	ETHMETS	PPB	10	2	2	***	.			Ethyl methanesulfonate
B88	FLUORAN	PPB	10	2	2	***	.			Fluoranthene
B89	HEXCBEN	PPB	10	2	2	***	.			Hexachlorobenzene
B90	HEXCBUT	PPB	10	2	2	***	.			Hexachlorobutadiene
B91	HEXCCYC	PPB	10	2	2	***	.			Hexachlorocyclopentadiene
B92	HEXCETH	PPB	10	2	2	***	.			Hexachloroethane
B93	INDENOP	PPB	10	2	2	***	.			Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	PPB	10	2	2	***	.			Isosafrole
B95	MALOILE	PPB	10	2	2	***	.			Malononitrile
B96	MELPHAL	PPB	10	2	2	***	.			Melphalan
B97	METHAPY	PPB	10	2	2	***	.			Methapyrilene
B98	METHNYL	PPB	10	2	2	***	.			Metholonyl
B99	METAZIR	PPB	10	2	2	***	.			2-methylaziridine
C01	METCHAN	PPB	10	2	2	***	.			3-methylcholanthrene
C02	METBISC	PPB	10	2	2	***	.			4,4'-methylenebis(2-chloroaniline)
C03	METACTO	PPB	10	2	2	***	.			2-methyllactonitrile
C04	METACRY	PPB	10	2	2	***	.			Methyl methacrylate
C05	METMSUL	PPB	10	2	2	***	.			Methyl methanesulfonate
C06	METPROP	PPB	10	2	2	***	.			2-methyl-2-(methylthio) propionaldehyde-
C07	METHIOU	PPB	10	2	2	***	.			Methylthiouracil
C08	NAPHQUI	PPB	10	2	2	***	.			1,4-naphthoquinone
C09	1-napha	PPB	10	2	2	***	.			1-naphthylamine
C10	2-napha	PPB	10	2	2	***	.			2-naphthylamine
C11	NITRANI	PPB	50	2	2	***	.			P-nitroaniline
C12	NITBENZ	PPB	10	2	2	***	.			Nitrobenzene
C13	NITPHEN	PPB	50	2	2	***	.			4-nitrophenol
C14	NNIBUTY	PPB	10	2	2	***	.			N-nitrosodi-n-butylamine

TABLE 3. (contd)

Constituent List=WAC 173-303-9905

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
C15	NNIDIEA	PPB	10	2	2	***	.			N-nitrosodiethanolamine
C16	NNIDIEY	PPB	10	2	2	***	.			N-nitrosodiethylamine
C17	NNIDIME	PPB	10	2	2	***	.			N-nitrosodimethylamine
C18	NNIMETH	PPB	10	2	2	***	.			N-nitrosomethylethylamine
C19	NNIURET	PPB	10	2	2	***	.			N-nitroso-n-methylurethane
C20	NNIVINY	PPB	10	2	2	***	.			N-nitrosomethylvinylamine
C21	NNIMORP	PPB	10	2	2	***	.			N-nitrosomorpholine
C22	NNINICO	PPB	10	2	2	***	.			N-nitrosonornicotine
C23	NNIPIPE	PPB	10	2	2	***	.			N-nitrosopiperidine
C24	NITRPYR	PPB	10	2	2	***	.			Nitrosopyrrolidine
C25	NITRTOL	PPB	10	2	2	***	.			5-nitro-o-toluidine
C26	PENTCHB	PPB	10	2	2	***	.			Pentachlorobenzene
C27	PENTCHN	PPB	10	2	2	***	.			Pentachloronitrobenzene
C28	PENTCHP	PPB	50	2	2	***	220	EPAP		Pentachlorophenol
C29	PHENTIN	PPB	10	2	2	***	.			Phenacetin
C30	PHENINE	PPB	10	2	2	***	.			Phenylenediamine
C31	PHTHEST	PPB	10	2	2	***	.			Phthalic acid esters
C32	PICOLIN	PPB	10	2	2	***	.			2-picoline
C33	PRONIDE	PPB	10	2	2	***	.			Pronamide
C34	RESERPI	PPB	10	2	2	***	.			Reserpine
C35	RESORCI	PPB	10	2	2	***	.			Resorcinol
C36	SAFROL	PPB	10	2	2	***	.			Safrol
C37	TETRCHB	PPB	10	2	2	***	.			1,2,4,5-tetrachlorobenzene
C39	TETRCHP	PPB	10	2	2	***	.			2,3,4,6-tetrachlorophenol
C40	THIURAM	PPB	10	2	2	***	.			Thiuram
C41	TOLUDIA	PPB	10	2	2	***	.			Toluenediamine
C42	OTOLHYD	PPB	10	2	2	***	.			O-toluidine hydrochloride
C43	TRICHLB	PPB	10	2	2	***	.			1,2,4-trichlorobenzene
C44	245-trp	PPB	50	2	2	***	.			2,4,5-trichlorophenol
C45	246-trp	PPB	10	2	2	***	.			2,4,6-trichlorophenol
C46	TRIPHOS	PPB	10	2	2	***	.			O,o,o-triethyl phosphorothioate
C47	SYMTRIN	PPB	10	2	2	***	.			Sym-trinitrobenzene
C48	TRISPHO	PPB	10	2	2	***	.			Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	PPB	10	2	2	***	.			Benzo[a]pyrene
C50	CHLNAPZ	PPB	10	2	2	***	.			Chlornaphazine
C51	BIS2ETH	PPB	10	2	2	***	.			Bis(2-chloroisopropyl)ether
C52	HEXAENE	PPB	10	2	2	***	.			Hexachloropropene
C53	HYDRAZI	PPB	3000	2	2	***	.			Hydrazine
C54	HEXACHL	PPB	10	2	2	***	.			Hexachlorophene
C55	NAPHTHA	PPB	10	2	2	***	.			Naphthalene
C56	123TRI	PPB	10	2	2	***	.			1,2,3-trichlorobenzene
C58	135TRI	PPB	10	2	2	***	.			1,3,5-trichlorobenzene
C59	1234TE	PPB	10	2	2	***	.			1,2,3,4-tetrachlorobenzene
C60	1235TE	PPB	10	2	2	***	.			1,2,3,5-tetrachlorobenzene
C61	TETEPYR	PPB	2	2	2	***	.			Tetraethylpyrophosphate
C62	CHLLATE	PPB	30	2	2	***	.			Chlorobenzilate
C63	CARBPHT	PPB	2	2	2	***	.			Carbophenothion
C64	DISULFO	PPB	2	2	2	***	.			Disulfoton
C65	DIMETHO	PPB	2	2	2	***	.			Dimethoate
C66	METHPAR	PPB	2	2	2	***	.			Methyl parathion

TABLE 3. (contd)

-- Constituent List=WAC 173-303-9905 --

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
C67	PARATHI	PPB	2	2	2	***	.			Parathion
C70	CYANIDE	PPB	10	2	2	***	.			Cyanide
C71	FORMALN	PPB	500	2	2	***	.			Formalin
C77	PERCHLO	PPB	1000	2	2	***	.			Perchlorate
C79	KEROSEN	PPB	10000	2	2	***	.			Kerosene
C87	CITRUSR	PPB	1000	2	2	***	.			Citrus red
C90	PARALDE	PPB	2000	2	2	***	.			Paraldehyde
C91	STRYCHN	PPB	50	2	2	***	.			Strychnine
C92	MALHYDR	PPB	500	2	2	***	.			Maleic hydrazide
C93	NICOTIN	PPB	100	2	2	***	.			Nicotinic acid
C94	ACRYIDE	PPB	10000	2	2	***	0	EPAP		Acrylamide
C95	ALLYLAL	PPB	2500	2	2	***	.			Allyl alcohol
C97	CHLACET	PPB	16000	2	2	***	.			Chloroacetaldehyde
C98	CHLPROP	PPB	4000	2	2	***	.			3-chloropropionitrile
H03	ETHCARB	PPB	5000	2	2	***	.			Ethyl carbamate
H04	ETHCYAN	PPB	2000	2	2	***	.			Ethyl cyanide
H05	ETHOXID	PPB	3000	2	2	***	.			Ethylene oxide
H06	ETHMETH	PPB	10	2	2	***	.			Ethyl methacrylate
H09	ISOBUTY	PPB	1000	2	2	***	.			Isobutyl alcohol
H11	PROPYLA	PPB	10000	2	2	***	.			N-propylamine
H12	PROPYNO	PPB	8000	2	2	***	.			2-propyn-1-ol
H15	2,4,5-T	PPB	2	2	2	***	.			2,4,5-T
H40	FTHALLI	PPB	5	2	2	***	.			Thallium, filtered
I21	TRIBUPH	PPB	10	2	2	***	.			Tributylphosphoric acid

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986)
National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 4. Ground-Water Analyses for Constituents with at Least One Analysis Above Detection Limits for the 183-H Solar Evaporation Basins, December 1987 to February 1988

Well name	Collection Date	Duplicate sample number	1,1,1-T PPB 200	ALPHA PCI/L 15	ALUMNUM PPB .	AMMONIU PPB .	ARSENIC PPB 50	FARSENI PPB 50	BARIUM PPB 1000	FBARIUM PPB 1000	BETA PCI/L 50	FCADMIU PPB 10
1-H3-1	28DEC87		<5	6.290	<150	<50	<5	<5	58	60	12.00	<2
1-H3-2A	22DEC87		<5	1.540	<150	<50	<5	<5	26	28	6.13	<2
1-H3-2B	22DEC87		<5	0.974	<150	<50	<5	<5	33	32	*1.73	<2
1-H4-3	18DEC87		<5	110.000	<150	<50	<5	5	16	20	198.00	<2
	07JAN88		<5	113.000	<150	<50	<5	<5	14	20	190.00	<2
	11FEB88		31	125.000	185	<50	<5	<5	51	44	469.00	<2
1-H4-4	17DEC87		<5	60.700	<150	<50	5	5	43	40	183.00	<2
	17DEC87	1	<5	51.400	.	<50	.	.	.	44	174.00	<2
	06JAN88		<5	60.300	<150	<50	5	5	43	36	149.00	<2
	06JAN88	1	<5	44.500	.	<50	.	.	.	35	139.00	2
	11FEB88		<5	47.200	<150	54	<5	5	70	62	210.00	<2
	11FEB88	1	<5	57.500	.	<50	.	<5	.	65	208.00	<2
1-H4-5	17DEC87		<5	1.480	<150	<50	5	5	69	68	8.59	<2
1-H4-6	18DEC87		<5	2.850	<150	52	<5	<5	51	50	10.10	<2
1-H4-9	28DEC87		<5	7.570	<150	<50	8	7	82	87	164.00	2
	28DEC87	1	<5	6.110	.	<50	.	.	.	84	128.00	<2
	07JAN88		<5	8.650	<150	<50	8	10	86	75	159.00	<2
	07JAN88	1	<5	.	.	<50	.	.	.	78	.	<2
	10FEB88		<5	14.500	<150	<50	7	8	97	88	223.00	<2
1-H4-11	16DEC87		<5	1.930	<150	<50	<5	<5	36	40	61.00	<2
	07JAN88		<5	1.590	<150	<50	<5	<5	38	37	103.00	<2
	10FEB88		<5	2.570	<150	<50	<5	<5	38	34	81.00	<2
1-H4-12A	15DEC87		<5	8.650	<150	<50	<5	<5	68	66	38.90	<2
	05JAN88		<5	4.210	<150	<50	<5	<5	59	38	13.90	<2
	08FEB88		<5	7.250	<150	<50	<5	<5	59	54	23.30	<2
1-H4-12B	15DEC87		<5	7.760	<150	<50	<5	<5	113	107	35.30	<2
	04JAN88		<5	3.790	<150	<50	<5	<5	107	97	14.70	<2
	08FEB88		<5	7.290	<150	<50	<5	<5	113	104	39.40	<2
1-H4-12C	15DEC87		<5	1.690	<150	<50	5	6	8	9	4.08	<2
	04JAN88		<5	1,030	<150	<50	6	6	7	<6	5.38	<2
	08FEB88		<5	1.790	<150	<50	<5	<5	10	6	3.88	<2
1-H4-13	16DEC87		<5	*0.586	<150	<50	<5	<5	25	30	76.30	<2
1-H4-14	22DEC87		<5	*0.662	<150	<50	<5	<5	25	26	7.70	<2
1-H4-15A	14DEC87		<5	2.180	<150	<50	<5	<5	89	94	9.06	<2
1-H4-15B	14DEC87		<5	1.270	<150	<50	<5	<5	115	123	8.11	<2
1-H4-16	23DEC87		<5	*0.820	<150	<50	<5	<5	24	24	8.99	<2
	05JAN88		<5	*0.200	<150	<50	<5	<5	21	<6	15.10	<2
	09FEB88		<5	1.020	<150	<50	<5	<5	26	19	13.80	<2
1-H4-17	28DEC87		<5	2.170	919	<50	<5	<5	84	73	9.42	<2
	06JAN88		<5	2.930	791	<50	<5	<5	82	67	11.50	<2
	09FEB88		<5	4.340	196	<50	<5	<5	75	69	10.50	<2
1-H4-18	23DEC87		<5	1.580	<150	<50	<5	<5	34	34	15.10	<2
	05JAN88		<5	1.230	<150	<50	<5	<5	35	15	19.00	<2
	09FEB88		<5	1.700	<150	<50	<5	<5	35	30	18.20	<2

TABLE 4. (contd)

Well name	Collection Date	Duplicate sample number	CADMIUM PPB 10	FCALCIU PPB .	CALCIUM PPB .	CHLFORM PPB 100	CHLORID PPB 250000*	FCHROMI PPB 50	CHROMUM PPB 50	CO 60 PCI/L 100	CONDFLD UMHO 700*	COPPER PPB 1300*
1-H3-1	28DEC87		<2	80,700	90,000	#2	12,900	70	79	6.08	646	<10
1-H3-2A	22DEC87		<2	39,100	40,400	18	6,010	30	36	.	308	<10
1-H3-2B	22DEC87		<2	41,000	46,700	20	6,000	23	27	.	298	<10
1-H4-3	18DEC87		<2	13,300	12,400	17	9,110	210	242	*2.70	926	11
	07JAN88		<2	11,800	11,900	17	10,300	217	212	.	735	<10
	11FEB88		<2	27,600	31,200	11	9,370	262	309	.	1,304	34
1-H4-4	17DEC87		<2	27,600	43,300	8	5,950	167	234	.	709	<10
	17DEC87	1	.	30,500	.	8	5,950	184	.	.	.	.
	06JAN88		<2	29,500	34,700	8	6,400	172	238	.	686	49
	06JAN88	1	.	30,100	.	8	6,340	180	.	.	.	.
	11FEB88		<2	42,800	48,100	12	6,710	207	291	.	779	<10
	11FEB88	1	.	43,200	.	12	6,600	209	.	.	.	.
1-H4-5	17DEC87		<2	73,300	75,000	15	7,550	142	183	.	475	20
1-H4-6	18DEC87		<2	72,100	71,000	6	14,600	89	79	.	511	11
1-H4-9	28DEC87		<2	108,000	113,000	12	10,700	108	119	.	798	<10
	28DEC87	1	.	106,000	.	14	10,800	106	.	.	.	.
	07JAN88		<2	105,000	119,000	13	10,900	106	116	.	641	<10
	07JAN88	1	.	114,000	.	14	10,800	107	.	.	.	.
	10FEB88		<2	129,000	132,000	12	10,100	94	105	.	781	<10
1-H4-11	16DEC87		<2	53,800	56,800	27	5,040	155	167	.	347	<10
	07JAN88		<2	58,600	57,200	24	5,560	180	176	.	300	26
	10FEB88		<2	49,800	57,000	24	4,990	111	127	.	308	<10
1-H4-12A	15DEC87		2	69,500	73,900	17	7,170	173	177	.	516	<10
	05JAN88		<2	58,100	66,300	8	6,240	88	150	.	371	149
	08FEB88		<2	58,400	56,700	8	6,240	135	132	.	448	<10
1-H4-12B	15DEC87		<2	71,500	79,400	17	7,170	159	184	.	494	<10
	04JAN88		<2	75,200	79,300	15	7,250	181	204	.	483	<10
	08FEB88		<2	73,100	73,600	15	7,540	160	164	.	530	<10
1-H4-12C	15DEC87		<2	31,400	34,000	8	2,720	234	258	.	272	26
	04JAN88		<2	32,600	39,000	8	2,870	222	289	.	288	<10
	08FEB88		<2	33,000	30,700	8	2,680	242	227	.	276	<10
1-H4-13	16DEC87		<2	44,500	44,600	24	4,240	48	48	.	285	<10
1-H4-14	22DEC87		<2	40,600	44,800	26	5,030	294	331	.	305	<10
1-H4-15A	14DEC87		<2	58,700	57,700	9	6,270	147	148	.	310	<10
1-H4-15B	14DEC87		<2	55,000	52,100	9	5,620	151	145	.	344	<10
1-H4-16	23DEC87		<2	42,100	44,500	30	5,590	11	16	.	295	<10
	05JAN88		<2	48,800	47,100	35	6,660	<10	14	.	263	<10
	09FEB88		<2	43,700	44,300	29	6,080	<10	16	.	269	<10
1-H4-17	28DEC87		3	78,500	90,100	8	10,900	67	80	.	555	10
	06JAN88		<2	83,700	94,900	11	11,200	84	95	.	630	<10
	09FEB88		<2	81,700	82,400	9	10,300	90	95	.	528	<10
1-H4-18	23DEC87		<2	47,100	50,900	24	4,850	263	285	.	353	<10
	05JAN88		<2	48,900	53,800	20	5,550	214	293	.	315	<10
	09FEB88		<2	45,400	49,100	25	5,420	240	257	.	328	<10

TABLE 4. (contd)

Well name	Collection Date	Duplicate sample number	FCOPPER PPB 1300*	CS-137 PCI/L 200	FLUORID PPB 4000	IRON PPB 300*	FIRON PPB 300*	LEADGF PPB 50	MAGNES PPB .	FMAGNES PPB .	FMANGAN PPB 50*	MANGESE PPB 50*
1-H3-1	28DEC87		<10	*2.120	583	240	<30	<5	22,400	21,900	<5	9
1-H3-2A	22DEC87		<10	.	<500	50	<30	<5	9,190	9,670	<5	<5
1-H3-2B	22DEC87		<10	.	<500	<30	<30	<5	10,300	10,100	28	32
1-H4-3	18DEC87		<10	*-0.249	929	1,130	40	<5	2,000	2,230	<5	12
	07JAN88		<10	.	939	80	38	<5	2,050	1,960	<5	<5
	11FEB88		24	.	<500	1,580	30	<5	5,230	4,820	<5	30
1-H4-4	17DEC87		<10	.	653	563	<30	<5	4,780	4,370	<5	15
	17DEC87	1	<10	.	685	.	<30	.	.	4,690	<5	.
	06JAN88		<10	.	715	1,080	<30	<5	5,070	4,260	<5	5
	06JAN88	1	<10	.	702	.	33	.	.	4,430	<5	.
	11FEB88		<10	.	<500	983	<30	5	7,620	7,010	<5	5
	11FEB88	1	<10	.	<500	.	<30	.	.	7,040	<5	.
1-H4-5	17DEC87		<10	.	<500	4,450	<30	88	12,000	12,000	<5	30
1-H4-6	18DEC87		<10	.	594	620	34	<5	14,900	15,700	53	102
1-H4-9	28DEC87		<10	.	650	216	<30	<5	21,300	23,100	<5	5
	28DEC87	1	<10	.	607	.	<30	.	.	22,100	<5	.
	07JAN88		<10	.	638	54	<30	<5	23,500	20,800	<5	<5
	07JAN88	1	<10	.	639	.	<30	.	.	21,800	<5	.
	10FEB88		<10	.	<500	57	<30	<5	25,600	25,500	<5	<5
1-H4-11	16DEC87		<10	.	<500	<30	<30	<5	7,930	7,940	<5	<5
	07JAN88		<10	.	<500	42	<30	<5	8,460	8,290	<5	<5
	10FEB88		<10	.	<500	39	<30	<5	8,090	7,310	<5	<5
1-H4-12A	16DEC87		<10	.	<500	58	<30	<5	10,700	10,600	<5	<5
	05JAN88		<10	.	<500	<30	<30	7	9,880	9,440	<5	<5
	08FEB88		<10	.	<500	<30	<30	<5	9,500	9,390	<5	<5
1-H4-12B	15DEC87		<10	.	<500	37	<30	<5	12,200	11,500	<5	<5
	04JAN88		<10	.	<500	<30	<30	<5	12,000	11,400	<5	<5
	08FEB88		<10	.	<500	<30	<30	<5	12,200	11,400	<5	<5
1-H4-12C	15DEC87		<10	.	<500	84	48	<5	11,900	11,700	<5	<5
	04JAN88		<10	.	<500	107	<30	<5	13,000	11,500	<5	5
	08FEB88		<10	.	<500	41	41	<5	11,500	12,000	5	<5
1-H4-13	16DEC87		<10	.	<500	64	<30	<5	7,140	7,590	<5	<5
1-H4-14	22DEC87		<10	.	<500	<30	<30	<5	8,560	8,720	<5	<5
1-H4-15A	14DEC87		<10	.	<500	50	<30	<5	11,200	11,700	<5	<5
1-H4-15B	14DEC87		<10	.	<500	31	<30	<5	11,400	12,200	5	5
1-H4-16	23DEC87		<10	.	<500	64	<30	<5	5,390	5,620	<5	<5
	05JAN88		<10	.	<500	<30	<30	<5	5,590	5,840	<5	<5
	09FEB88		<10	.	<500	<30	<30	<5	5,530	5,450	<5	<5
1-H4-17	28DEC87		<10	.	507	1,630	<30	13	16,400	15,400	<5	33
	06JAN88		<10	.	501	1,450	<30	<5	16,700	15,400	<5	36
	09FEB88		<10	.	<500	338	<30	<5	16,000	15,100	<5	9
1-H4-18	23DEC87		<10	.	<500	127	<30	<5	8,610	8,640	<5	<5
	05JAN88		<10	.	<500	133	<30	<5	8,750	8,200	<5	<5
	09FEB88		<10	.	<500	36	<30	<5	8,590	8,070	<5	<5

TABLE 4. (contd)

Well name	Collection Date	Duplicate sample number	METHYCH PPB .	NICKEL PPB .	FNICKEL PPB .	NITRATE PPB 45000	PERCENE PPB .	PH-LAB .	PHFIELD .	PHOSPHA PPB .	FPOTASS PPB .	POTASUM PPB .
1-H3-1	28DEC87		81	<10	<10	69,900	#1	7.50	8.9	<1,000	6,950	6,430
1-H3-2A	22DEC87		<10	<10	<10	16,900	<5	8.00	7.7	<1,000	4,840	4,290
1-H3-2B	22DEC87		<10	<10	<10	14,700	<5	8.18	7.6	<1,000	5,320	4,730
1-H4-3	18DEC87		<10	31	11	246,000	<5	8.30	7.5	11,700	3,480	3,490
	07JAN88		<10	10	<10	273,000	<5	8.06	8.7	13,100	3,750	3,740
	11FEB88		<10	33	27	619,000	13	7.89	7.7	<1,000	5,730	5,690
1-H4-4	17DEC87		<10	10	<10	139,000	<5	7.91	7.6	6,240	4,150	4,150
	17DEC87	1	<10	.	<10	139,000	<5	.	.	6,520	4,160	.
	06JAN88		#4	11	<10	162,000	<5	7.83	6.8	7,350	4,120	3,960
	06JAN88	1	#3	.	<10	161,000	<5	.	.	8,670	4,380	.
	11FEB88		<10	12	<10	288,000	<5	7.69	7.7	<1,000	5,230	5,330
	11FEB88	1	<10	.	10	281,000	<5	.	.	<1,000	5,200	.
1-H4-5	17DEC87		<10	<10	<10	36,200	<5	7.68	7.0	<1,000	4,870	4,600
1-H4-6	18DEC87		<10	<10	<10	38,000	<5	7.89	7.2	<1,000	6,140	6,070
1-H4-9	28DEC87		<10	<10	10	198,000	<5	7.58	8.0	6,560	7,170	6,250
	28DEC87	1	<10	.	<10	198,000	<5	.	.	6,580	6,750	.
	07JAN88		<10	<10	<10	206,000	<5	7.61	8.5	8,600	6,250	6,650
	07JAN88	1	<10	.	<10	206,000	<5	.	.	8,810	6,400	.
	10FEB88		<10	<10	<10	131,000	<5	7.59	7.6	<1,000	6,730	6,640
1-H4-11	16DEC87		<10	<10	<10	26,600	<5	7.76	7.5	<1,000	2,820	2,730
	07JAN88		<10	<10	<10	50,400	<5	7.77	7.6	<1,000	2,970	2,880
	10FEB88		<10	<10	<10	26,100	<5	7.63	7.7	<1,000	2,620	2,760
1-H4-12A	15DEC87		<10	<10	<10	56,700	<5	7.77	9.4	<1,000	4,330	4,580
	05JAN88		<10	<10	<10	33,900	<5	7.70	6.8	<1,000	4,800	4,560
	08FEB88		<10	<10	<10	35,200	<5	7.81	7.0	<1,000	4,550	4,730
1-H4-12B	15DEC87		<10	<10	<10	52,500	<5	7.74	8.2	<1,000	5,090	5,000
	04JAN88		<10	<10	<10	44,600	<5	7.70	8.1	<1,000	4,710	4,890
	08FEB88		<10	<10	<10	50,000	<5	7.84	7.5	<1,000	4,820	5,210
1-H4-12C	15DEC87		<10	34	29	5,880	<5	7.79	8.3	<1,000	4,870	4,570
	04JAN88		<10	43	29	6,330	<5	7.80	8.0	<1,000	4,440	4,810
	08FEB88		<10	32	35	5,570	<5	7.91	6.8	<1,000	4,760	4,630
1-H4-13	16DEC87		<10	<10	<10	19,700	<5	7.47	7.0	<1,000	2,290	2,010
1-H4-14	22DEC87		<10	<10	<10	19,800	<5	8.02	7.5	<1,000	4,530	3,900
1-H4-15A	14DEC87		<10	<10	<10	30,500	<5	7.69	7.4	<1,000	5,090	5,080
1-H4-15B	14DEC87		<10	<10	<10	28,500	<5	7.69	7.5	<1,000	4,820	4,940
1-H4-16	23DEC87		<10	<10	<10	13,000	<5	7.62	9.1	<1,000	3,060	2,660
	05JAN88		<10	<10	<10	18,300	<5	7.88	6.5	<1,000	3,010	2,620
	09FEB88		<10	<10	<10	15,100	<5	7.99	7.9	<1,000	2,830	2,710
1-H4-17	28DEC87		49	<10	<10	48,500	<5	7.50	7.7	<1,000	7,550	7,180
	06JAN88		#3	<10	<10	52,000	<5	7.27	6.2	<1,000	6,650	6,590
	09FEB88		<10	<10	<10	46,200	<5	7.62	7.7	<1,000	6,750	7,130
1-H4-18	23DEC87		<10	<10	<10	20,100	<5	7.57	8.4	<1,000	4,370	3,980
	05JAN88		#5	<10	<10	22,700	<5	7.71	6.4	<1,000	4,080	3,940
	09FEB88		<10	<10	<10	20,400	<5	7.83	7.7	<1,000	4,040	4,070

TABLE 4. (contd)

Well name	Collection Date	Duplicate sample number	RADIUM PCI/L 5	RU 106 PCI/L 30	SODIUM PPB .	FSODIUM PPB .	SR 90 PCI/L 8	FSTRONT PPB .	STRONUM PPB .	SULFATE PPB 250000*	TC PPB .	TDS PPB 500000*
1-H3-1	28DEC87		0.2120	*-29.5	21,100	23,700	*-0.0323	508	534	83,400	43,700	432,000
1-H3-2A	22DEC87		*0.1090	.	12,400	14,200	.	222	222	38,600	24,800	217,000
1-H3-2B	22DEC87		*0.1110	.	9,490	11,200	.	236	246	38,300	23,900	199,000
1-H4-3	18DEC87		*0.1170	*-21.5	177,000	191,000	0.6910	74	67	84,400	34,000	664,000
	07JAN88		*0.0784	.	209,000	197,000	.	65	66	89,100	33,600	428,000
	11FEB88		*-0.0457	.	301,000	298,000	.	163	169	107,000	34,900	1,140,000
1-H4-4	17DEC87		*0.0256	.	92,800	95,500	.	151	165	53,800	30,500	448,000
	17DEC87	1	.	.	.	99,700	.	161	.	54,100	.	.
	06JAN88		*0.0213	.	81,400	95,900	.	142	169	57,400	27,900	408,000
	06JAN88	1	.	.	.	99,200	.	147	.	58,000	.	.
	11FEB88		0.1600	.	116,000	121,000	.	231	242	64,100	30,400	595,000
	11FEB88	1	.	.	.	120,000	.	233	.	63,600	.	.
1-H4-5	17DEC87		*0.0640	.	11,000	12,000	.	325	330	64,900	33,900	299,000
1-H4-6	18DEC87		*0.0989	.	24,400	25,200	.	373	364	90,200	32,900	377,000
1-H4-9	28DEC87		0.1560	.	31,600	39,900	.	538	514	85,800	36,400	564,000
	28DEC87	1	.	.	.	37,100	.	520	.	88,300	.	.
	07JAN88		*0.0201	.	34,600	31,900	.	495	539	94,400	37,300	336,000
	07JAN88	1	0.2210	.	.	32,800	.	500	.	92,200	.	.
	10FEB88		*0.1150	.	37,500	37,500	.	572	570	95,200	46,800	647,000
1-H4-11	16DEC87		*0.0460	.	9,550	9,960	.	246	247	40,800	27,200	215,000
	07JAN88		*-0.0010	.	11,100	10,700	.	254	257	44,400	25,700	156,000
	10FEB88		*0.0720	.	7,960	7,530	.	221	234	39,800	26,600	260,000
1-H4-12A	15DEC87		*0.0141	.	13,800	13,400	.	318	325	59,900	34,000	330,000
	05JAN88		*-0.0330	.	12,300	12,700	.	258	294	50,500	27,600	263,000
	08FEB88		*0.0200	.	15,000	14,100	.	263	268	43,800	29,800	307,000
1-H4-12B	15DEC87		*0.0922	.	12,000	12,200	.	330	360	59,300	33,800	318,000
	04JAN88		*0.0659	.	10,800	10,700	.	322	349	57,300	30,700	303,000
	08FEB88		*0.1450	.	13,300	11,900	.	323	340	52,200	32,800	339,000
1-H4-12C	15DEC87		*0.0036	.	4,960	5,250	.	216	223	24,700	33,900	173,000
	04JAN88		*-0.0517	.	4,680	4,440	.	207	249	26,400	23,500	186,000
	08FEB88		*0.0253	.	4,500	5,290	.	215	203	23,000	24,700	190,000
1-H4-13	16DEC87		*0.0257	.	6,350	7,290	.	205	193	33,900	23,900	187,000
1-H4-14	22DEC87		*-0.0006	.	7,760	8,890	.	216	219	42,800	22,800	228,000
1-H4-15A	14DEC87		*0.1570	.	10,700	11,000	.	289	276	55,800	32,000	284,000
1-H4-15B	14DEC87		0.2610	.	10,400	10,200	.	284	269	49,100	31,300	301,000
1-H4-16	23DEC87		*0.0038	.	4,460	5,130	.	198	198	26,900	21,200	158,000
	05JAN88		*0.1040	.	4,320	4,800	.	198	207	30,500	21,300	166,000
	09FEB88		*0.0536	.	4,540	4,600	.	196	197	28,200	19,000	180,000
1-H4-17	28DEC87		0.5320	.	16,800	18,100	.	375	406	93,700	35,600	384,000
	06JAN88		0.2200	.	14,800	15,700	.	366	413	101,000	35,800	388,000
	09FEB88		0.2560	.	16,800	14,800	.	371	370	86,800	36,700	440,000
1-H4-18	23DEC87		*0.0297	.	9,780	11,200	.	229	237	37,300	26,500	221,000
	05JAN88		*0.0616	.	10,200	10,300	.	212	247	41,600	28,400	218,000
	09FEB88		*0.0525	.	10,700	10,300	.	215	225	36,200	27,800	222,000

TABLE 4. (contd)

Well name	Collection Date	Duplicate sample number	TOC PPB .	TOX PPB .	U-CHEM UG/L .	FVANADI PPB .	VANADUM PPB .	ZINC PPB 5000*	FZINC PPB 5000*
1-H3-1	28DEC87		1,140	#68.8	9.79	8	7	5	<5
1-H3-2A	22DEC87		#824	#27.1	.	9	<5	6	<5
1-H3-2B	22DEC87		#535	#23.3	.	<5	<5	7	<5
1-H4-3	18DEC87		#841	#43.8	131.00	9	5	<5	5
	07JAN88		#807	#19.9	.	8	10	<5	<5
	11FEB88		#971	#28.9	.	7	6	6	<5
1-H4-4	17DEC87		#609	#12.1	.	<5	<5	328	90
	17DEC87	1	.	.	.	6	.	.	101
	06JAN88		#611	#13.0	.	6	<5	260	133
	06JAN88	1	.	.	.	<5	.	.	129
	11FEB88		#968	#22.3	.	<5	5	215	96
	11FEB88	1	.	.	.	<5	.	.	102
1-H4-5	17DEC87		#714	#17.9	.	6	<5	2400	109
1-H4-6	18DEC87		#901	#16.3	.	7	<5	269	145
1-H4-9	28DEC87		1,040	#29.4	.	<5	<5	6	6
	28DEC87	1	.	.	.	<5	.	.	8
	07JAN88		#999	#18.7	.	5	<5	6	<5
	07JAN88	1	.	.	.	5	.	.	<5
	10FEB88		1,180	#21.4	.	<5	<5	<5	<5
1-H4-11	16DEC87		#572	#33.7	.	<5	<5	5	<5
	07JAN88		#593	#30.0	.	<5	<5	22	<5
	10FEB88		#675	#26.7	.	<5	<5	<5	<5
1-H4-12A	15DEC87		#851	#17.1	.	<5	<5	12	<5
	05JAN88		#570	#26.1	.	<5	<5	91	<5
	08FEB88		#672	#14.9	.	<5	<5	<5	<5
1-H4-12B	15DEC87		#798	#13.7	.	5	<5	13	5
	04JAN88		#872	#24.0	.	6	<5	7	6
	08FEB88		#817	#21.2	.	<5	<5	9	6
1-H4-12C	15DEC87		#314	#12.1	.	25	22	25	6
	04JAN88		#288	#15.7	.	26	24	11	5
	08FEB88		#333	#27.5	.	23	22	6	6
1-H4-13	16DEC87		#635	#24.6	.	<5	<5	12	8
1-H4-14	22DEC87		#623	#31.0	.	6	<5	6	<5
1-H4-15A	14DEC87		#664	#7.4	.	<5	5	8	<5
1-H4-15B	14DEC87		#570	#8.5	.	<5	6	26	24
1-H4-16	23DEC87		#600	#27.0	.	<5	<5	<5	<5
	05JAN88		#587	#36.4	.	<5	<5	<5	<5
	09FEB88		#747	#46.6	.	<5	<5	<5	<5
1-H4-17	28DEC87		#841	#33.1	.	<5	<5	14	5
	06JAN88		#814	#13.8	.	<5	<5	8	<5
	09FEB88		#843	#17.7	.	<5	<5	7	<5
1-H4-18	23DEC87		#576	#36.4	.	7	<5	7	5
	05JAN88		#604	#22.7	.	<5	<5	10	<5
	09FEB88		#702	#32.5	.	6	<5	9	<5

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable
* - Less than 2-sigma counting error for radionuclides

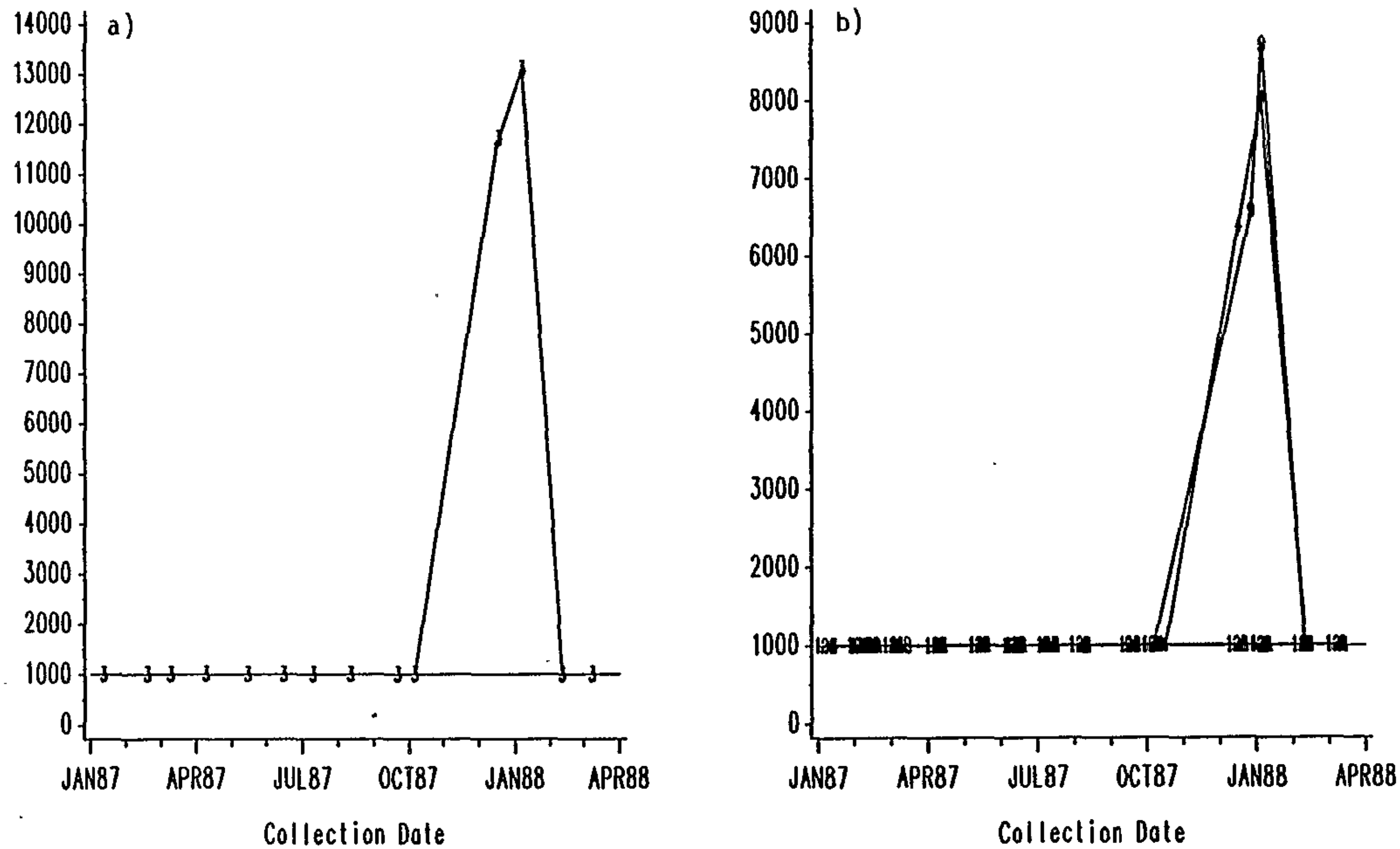

FIGURE 5. Phosphate Concentration (ppb) in Wells 199-H4-3 (a), 199-H4-4, and 199-H4-9 (b)

Elevated concentrations of 1,1,1-T (31 ppb) and PCE (31 ppb) were reported in well 199-H4-3 in February 1988. These wells will continue to be monitored closely in the following months.

Routine analyses for uranium and technetium were added in March 1988. These constituents were found in significant proportions in solutions collected from the 183-H basins and are suspected to be present in the ground water. In addition, they are expected to explain most of the contributions to the gross alpha and gross beta measurements.

As shown in Figure 6, chromium concentrations are increasing in well 199-H4-12C. These wells will continue to be monitored closely in the following months.

Quality Assurance/Quality Control

Results of interlaboratory comparisons include anions, metals, and radiological constituents for December and January, and volatile organic analyses for November and December. All results, with the exception of chloroform, phosphate, gross alpha, and gross beta, were consistent between UST and PNL. The chloroform results may have been caused by the use of old calibration standards. These standards have since been replaced. The original UST samples are currently being reanalyzed by PNL for phosphate. Analytical procedures for gross alpha and gross beta are not standardized between laboratories and may contribute to the observed differences. These procedures will be exchanged to investigate sources of discrepancies.

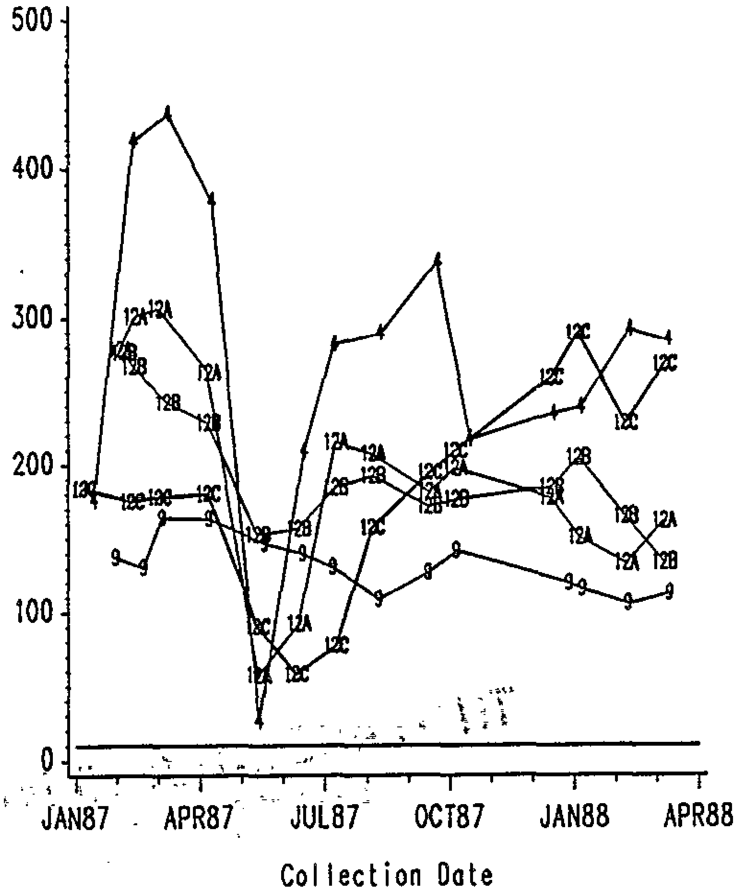

FIGURE 6. Chromium Concentrations in Wells 199-H4-4, 199-H4-9, 199-H4-12A, 199-H4-12B, and 199-H4-12C (numbers shown are abbreviations of well names)

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200 AREAS LOW-LEVEL BURIAL GROUNDS

G. V. Last

Work discussed in the previous quarterly report (PNL 1988) focused on activities associated with the construction, development, and hydrologic testing of monitoring wells surrounding the 200 Areas Low-Level Burial Grounds. At that time, all 35 wells were completed. Figures 7 and 8 illustrate the locations of the wells and the waste management areas (WMA). This report describes subsequent activities associated with the hydrogeologic characterization of the 200 Areas Low-Level Burial Grounds.

As noted in the progress report for October 1 to December 31, 1987 (PNL 1988), borehole data for the 35 wells completed in the 200 Areas Low-Level Burial Grounds would be transmitted with the current quarterly report. These data are organized as follows:

- Appendix A, covering the wells in the 200-East Area, is contained in Volumes 2, 3, and 4.
- Appendix B, covering the wells in the 200-West Area, is contained in Volumes 5, 6, 7, and 8.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Well drilling efforts and hydrogeologic characterization activities including sampling for moisture content and developing preliminary fence diagrams are discussed in the next sections.

Well Drilling Effort

Downhole television inspection of the new wells in the 200-West Area identified six wells that required cleanup and/or further development. These wells (299-W7-6, 299-W10-13, 299-W10-14, 299-W15-16, 299-W15-17, and 299-W18-22) were bailed by KEH drillers until the water was clean (approximately 4 h). A second television inspection revealed that the screen and/or water in three wells remained dirty (wells 299-W7-6, 299-W10-14, and 299-W18-22). The wells will be cleaned using the purging/sampling pumps.

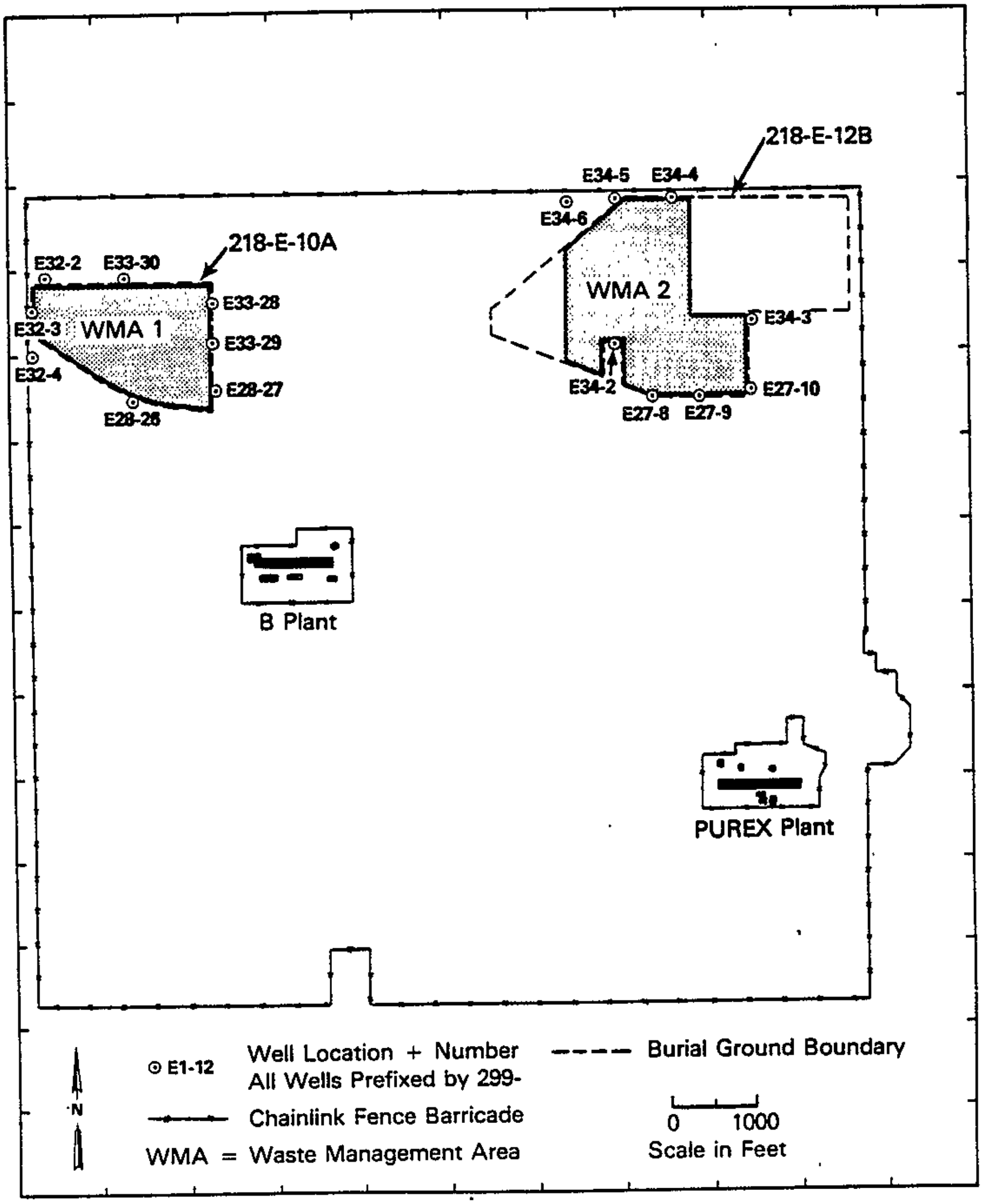

FIGURE 7. Monitoring Well Locations and Waste Management Areas for the 200-East Area

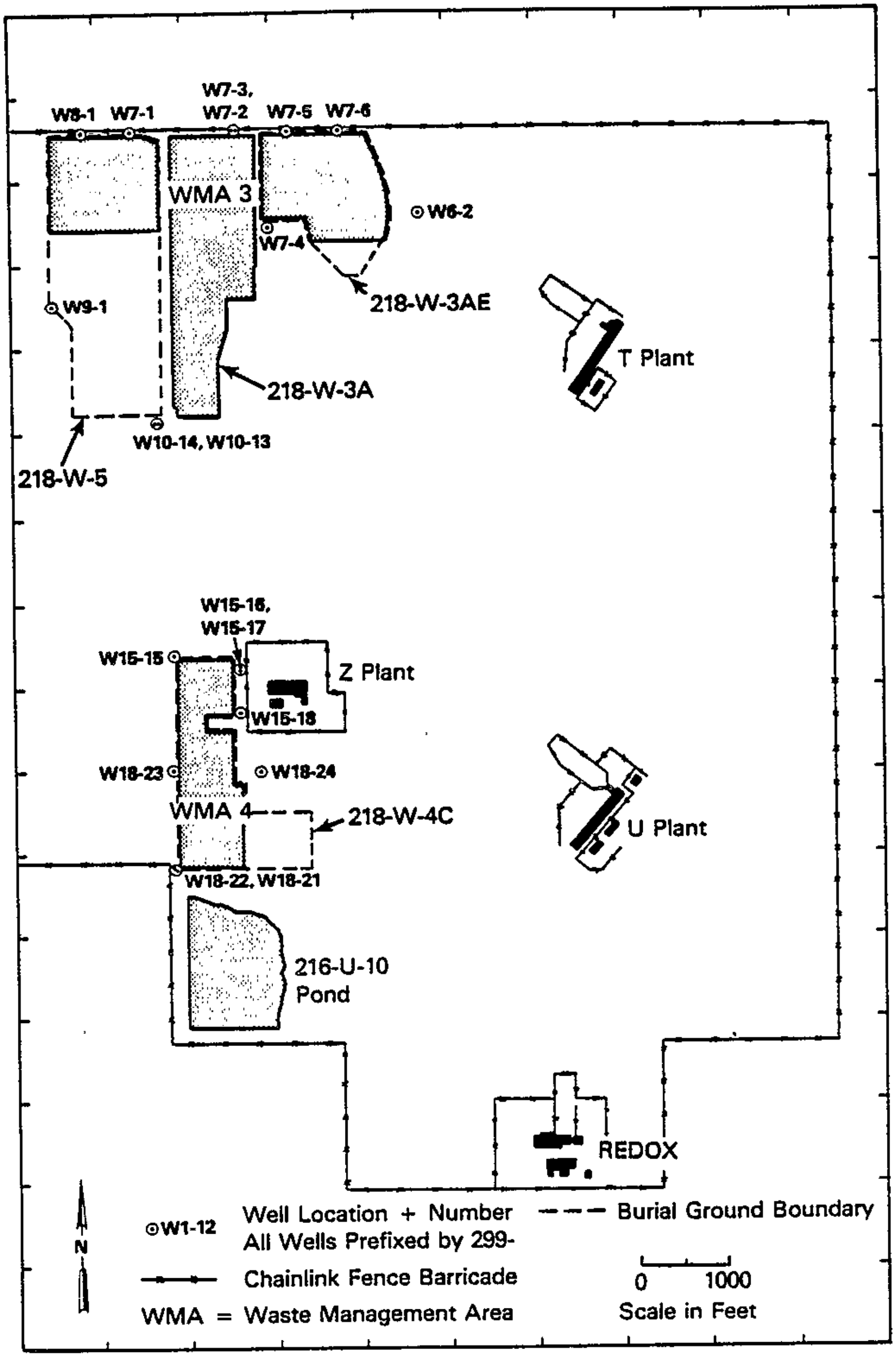

FIGURE 8. Monitoring Well Locations and Waste Management Areas for the 200-West Area

In early January 1988, a 2-ft section of 4-in.-diameter stainless steel casing was added to well 299-W7-5 to bring the top of the casing to between 2 and 3 ft above land surface in compliance with the construction specifications. Previously, the casing elevation had been surveyed at 671.14 ft above mean sea level. With the added 2 ft, this brings the casing elevation to an estimated 673.14 ft. The well has not been resurveyed.

Locks were installed on all the new wells in both the 200-East and 200-West Areas. The existing locks installed on the 200-East Area wells were replaced by the new locks purchased specifically for this project.

Hydrogeologic Characterization Effort

Efforts this quarter were directed at producing a draft interim characterization report, including cross sections, stratigraphic contour maps, fence diagrams, hydraulic conductivity maps, water-level maps, hydrographs, and water-quality maps. This report is scheduled for completion by May 23, 1988.

Laboratory analysis of the moisture contents of the borehole samples was completed (Tables 5 and 6), and particle-size analyses are nearly complete. Calcite ($CaCO_3$) analyses of the samples is only partially complete. No other physical or geochemical analyses have yet been started on the sediment samples.

Figures 9 and 10 are fence diagrams of the major geologic units beneath the 200-East and 200-West Area WMAs, respectively. The geologic correlations to date are based solely on the field geologist's descriptions, supplemented by the borehole geophysical logs. Some of the major findings from these geologic correlations are 1) the unconfined aquifer beneath WMA 1 and WMA 2 occurs within the Hanford formation, except beneath a small portion of WMA 1 where Ringold Formation sediments were also identified; 2) the unconfined aquifer beneath WMA 1 and WMA 2 thins to the northeast and pinches out against a basalt high that extends above the water table; 3) the unconfined aquifer beneath WMA 3 and WMA 4 occurs in the semiconsolidated sediments of the middle Ringold; and 4) the lower Ringold clay, interpreted to be the bottom of the unconfined aquifer beneath the 200-West Area, was not identified beneath the northern portion of WMA 3.

TABLE 5. Moisture Content for Wells Completed in the 200-East Area

Sample Interval, ft	Moisture Content, %
Well 299-E27-8	
109-110	7.01
114-115	6.10
119-120	5.51
124-125	5.84
129-130	6.13
136-137	6.01
139-140	6.59
144-145	13.43
149-150	11.90
154-155	9.20
159-160A	6.87
159-160B	6.37
164-165	7.37
169-170	7.57
174-175	6.58
179-180	6.81
184-185	7.55
189-190	6.13
194-195	8.60
Well 299-E28-26	
84-85	1.47
89-90	1.46
100	1.80
105	1.63
109-110	1.51
114-115	2.03
119-120	1.70
129-130	3.35
134-135	2.35
139-140	2.19
144-145	1.84
149-150	1.98
154-155	1.98
159-160	1.94
164-165	2.14
169-170	2.94
174-175	3.65
179-180	2.09
184-185	1.88
189-190	2.92
194-195	2.21
209-210	1.99
Well 299-E28-26 (contd)	
214-215	2.16
225	2.31
230	1.06
Well 299-E28-27	
4-5	1.16
64-65	1.89
69-70	2.45
74-75	2.18
99-100	2.40
104-105	2.52
109-110	2.12
114-115	4.23
119-120	2.55
124-125	2.86
129-130	2.65
134-135	3.54
139-140	2.36
144-145	4.68
149-150	2.01
154-155	2.26
164-165	1.89
169-170	2.09
174-175	2.62
179-180	2.45
185	2.55
190	2.57
194-195	4.18
210	3.09
214-215A	2.29
214-215B	2.53
219-220	2.23
224-225	2.25
239-240	4.05
249-250	2.44
254-255	1.58

TABLE 5. (contd)

Sample Interval, ft	Moisture Content, %	Sample Interval, ft	Moisture Content, %
Well 299-E32-2		Well-299-E32-3 (contd)	
59-60	1.98	94-95	2.12
64-65	2.86	99-100	2.45
69-70	3.17	104-105	2.51
74-75	1.70	109-110	2.29
79-80	2.89	115	3.93
84-85	1.94	120	2.44
89-90	1.88	125	2.45
94-95	1.77	129-130	2.54
99-100	1.63	134-135	1.85
104-105	1.60	139-140	1.98
109-110	2.00	150	2.09
114-115	2.03	155	1.93
120	2.09	160	1.89
125	2.19	164-165	1.78
129-130	2.24	169-170	2.44
134-135	2.56	174-175	2.15
139-140	2.36	179-180	2.00
144-145	2.47	180	2.70
149-150	2.61	185	2.49
154-155	1.92	189-190	3.21
159-160	2.03	194-195	2.70
169-170	2.08	200	2.46
164-165	2.06	204-205	2.36
174-175	2.20	210	3.33
179-180	2.83	215	2.84
184-185	2.47	219-220	2.44
194-195	2.59	224-225	2.59
199-200	2.37	229-230	2.43
204-205	2.64	234-235	2.09
209-210	2.53	239-240	2.26
214-215	2.47	244-245	2.88
220	2.54	249.250	2.20
225	2.18	254-255	1.83
230	2.15		
234-235	1.97		
239-240	1.97	Well 299-E32-4	
		64-65	3.61
Well 299-E32-3		69-70	3.02
		80	9.06
74-75	17.99	90	3.06
79-80	3.13	95	3.96
84-85	2.47	100	3.62
89-90	2.23	104-105	3.41

TABLE 5. (contd)

Sample Interval, ft	Moisture Content, %
Well 299-E32-04 (contd)	
109-110	4.72
114-115	5.03
119-120	5.25
124-125	5.85
130	3.42
135	4.14
140	3.40
145	2.84
149-150	2.77
154-155	2.78
159-160	6.30
164-165	4.87
169-170	2.77
174-175	2.33
180	2.69
185	7.12
190	3.23
195	2.59
209-210	3.14
214-215	2.54
219-220	2.68
224-225	2.22
229-230	2.01
Well 299-E33-29	
69-70	2.42
84-85	2.66
89-90	2.05
96-97	2.12
99-100	2.52
114-115	3.54
119-120	1.95
124-125	1.94
129-130	1.95
144-145	2.44
150	1.83
154-155	2.06
159-160	2.04
164-165	1.90
169-170	2.76
174-175	2.37
179-180	2.25
184-185	2.25
189-190	2.37
Well 299-E33-29 (contd)	
194-195	2.44
199-200	3.27
202-203	16.06
209-210	5.30
210	2.86
214-215	2.78
219-220	2.68
234-235	2.19
239-240	2.81
Well 299-E33-30	
59-60	3.48
69-70	1.97
64-65	2.27
74-75	2.39
79-80	2.16
84-85	2.28
89-90	2.39
95	3.60
100	1.55
104-105	1.55
109-110	1.72
115	2.35
120	3.66
124-125	2.00
129-130	1.91
134-135	1.85
139-140	2.04
144-145	2.08
149-150	1.78
154-155	1.94
159-160 A	1.89
159-160 B	2.03
174-175	2.10
179-180	2.42
184-185	2.43
169-170	1.95
189-190	2.96
194-195	2.49
203	16.20
204-205	3.86
unmarked depth	3.78
209-210	2.15

TABLE 5. (contd)

Sample Interval, ft	Moisture Content, %
Well 299-E33-30 (contd)	
214-215	2.79
219-220	2.53
224-250	2.77
234-235	2.28
239-240	2.21
244-245	2.03
249-250	2.33
Well 299-E24-6	
4-5	4.40

A,B = Duplicate samples.

All the aquifer tests conducted during the two previous quarters were analyzed. These analyses are currently undergoing internal technical review and reanalysis by other techniques. The preliminary results, however, are provided in Table 7 for the 200-East Area wells and Table 8 for the 200-West Area wells. Hydraulic conductivities for the Hanford formation ranged Ringold ranged from 0.2 to 140 ft/d, and those from the lower portion of the middle Ringold ranged from <0.1 to 2.0 ft/d. Storativity values were calculated only for the upper portion of the middle Ringold and ranged from 0.02 to 0.1.

Water levels are being measured at each new well and at a selected number of existing wells approximately every 2 weeks. Water-table maps from measurements made on February 11 and 12, 1988, are shown in Figures 11 and 12.

TABLE 6. Moisture Content Data for Wells Completed in the 200-West Area

Sample Interval, ft	Moisture Content, %	Sample Interval, ft	Moisture Content, %
Well 299-W6-2		**Well 299-W7-5 (contd)**	
5	2.28	174-175	2.34
10	1.87	179-180	2.15
		189-190	2.12
		194-195	2.45
Well 299-W7-1		199-200	3.38
		209-210	2.47
5-6	2.53	214-215	2.22
10-11	1.98	219-220	2.32
130	1.85		
135	11.39		
140	1.96	**Well 299-W7-6**	
142-143	1.31		
		5	2.92
		10	5.25
Well 299-W7-2			
4-5	7.90	**Well 299-W9-1**	
		5	3.51
Well 299-W7-3		10	4.13
		15	7.22
5	1.94	20	2.20
		25	2.39
		30	2.38
Well 299-W7-5		35	3.02
		40	2.56
5	6.57	45	4.64
10	2.95	50	2.65
65	2.15	55 A	1.79
69-70	2.35	55 B	2.30
75	1.76		
80	2.60		
84-85	1.80	**Well 299-W10-13**	
89-90	1.94		
94-95	2.13	5	5.98
99-100	2.03	10	9.91
104-105	1.80	15	5.89
109-110	3.09	20	3.92
114-115	2.79	25	4.17
119-120	1.62	30	4.97
124-125	2.03	36	7.33
129-130	1.87	40	3.94
144-145	2.07	45	3.78
149-150	2.10	50	6.20
154-155	2.00	55	4.46

TABLE 6. (contd)

Sample Interval, ft	Moisture Content, %
Well 299-W10-13 (contd)	
60	3.60
65	3.84
70	3.21
75	3.64
80	5.46
Well 299-W10-14	
4-5	5.92
9-10	6.94
Well 299-W15-15	
10	3.66
15	4.27
20-21	3.38
25	5.94
30	3.12
35	5.39
40	4.71
45	9.84
50	5.73
55	4.30
Well 299-W15-16	
4-5	13.87
9-10	3.39
15	2.85
20	5.62
25	4.55
30	2.92
35	6.19
40	5.47
45	14.88
50	4.04
55	4.59
60	4.45
65	10.86
70	6.08
75	3.33
80	3.67
Well 299-W15-16 (contd)	
85	3.85
89-90	3.80
95	3.51
100	1.88
105	2.26
110	2.06
Well 299-W15-18	
4-5	8.11
10-11	7.04
15-16	4.40
20	8.14
25	4.12
30	4.19
35	4.28
40	11.00
45.5	8.34
50-51	11.47
54-55	4.38
60	4.67
65	10.57
70	5.80
75	9.28
79-80	4.23
84-85	18.69
89-90	10.97
91-92	10.15
94-95	6.55
99-100	7.10
104-105	3.34
109-110	2.82
124-126	2.75
Well 299-W18-21	
4-5	4.72
9	14.92
10	4.01
15	3.94
20	3.32
25	6.63
30	6.47

TABLE 6. (contd)

Sample Interval, ft	Moisture Content, %
Well 299-W18-21 (contd)	
35	4.46
40	11.13
42	5.38
Well 299-W18-23	
4-5	8.72
9-10	4.23
14-15	3.42
19-20	4.99
24-25	10.32
29-30	9.17
34-35	4.38
39-40	17.29
44-45	3.79
49-50	7.96
54-55	2.87
59-60	2.83

Sample Interval, ft	Moisture Content, %
Well 299-W18-24	
5	5.27
9-10	6.99
14-15	7.93
17	3.46
20	3.13
21-22	5.81
24-25	3.07
30	3.17
34-35	6.81
38	2.79
40-41	2.15
75	8.15
80	6.87
85	4.34
90	2.90
95	5.37
99-100	2.48
104-105	3.53
109-111	2.49
112-113	2.54
114-115	2.97
119-121	2.77

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

Purging/sampling pumps have been ordered for the new monitoring wells and should be onsite during April 1988. The pumps will be installed immediately on delivery, and all should be installed by the end of May. Routine sampling is scheduled to begin in June.

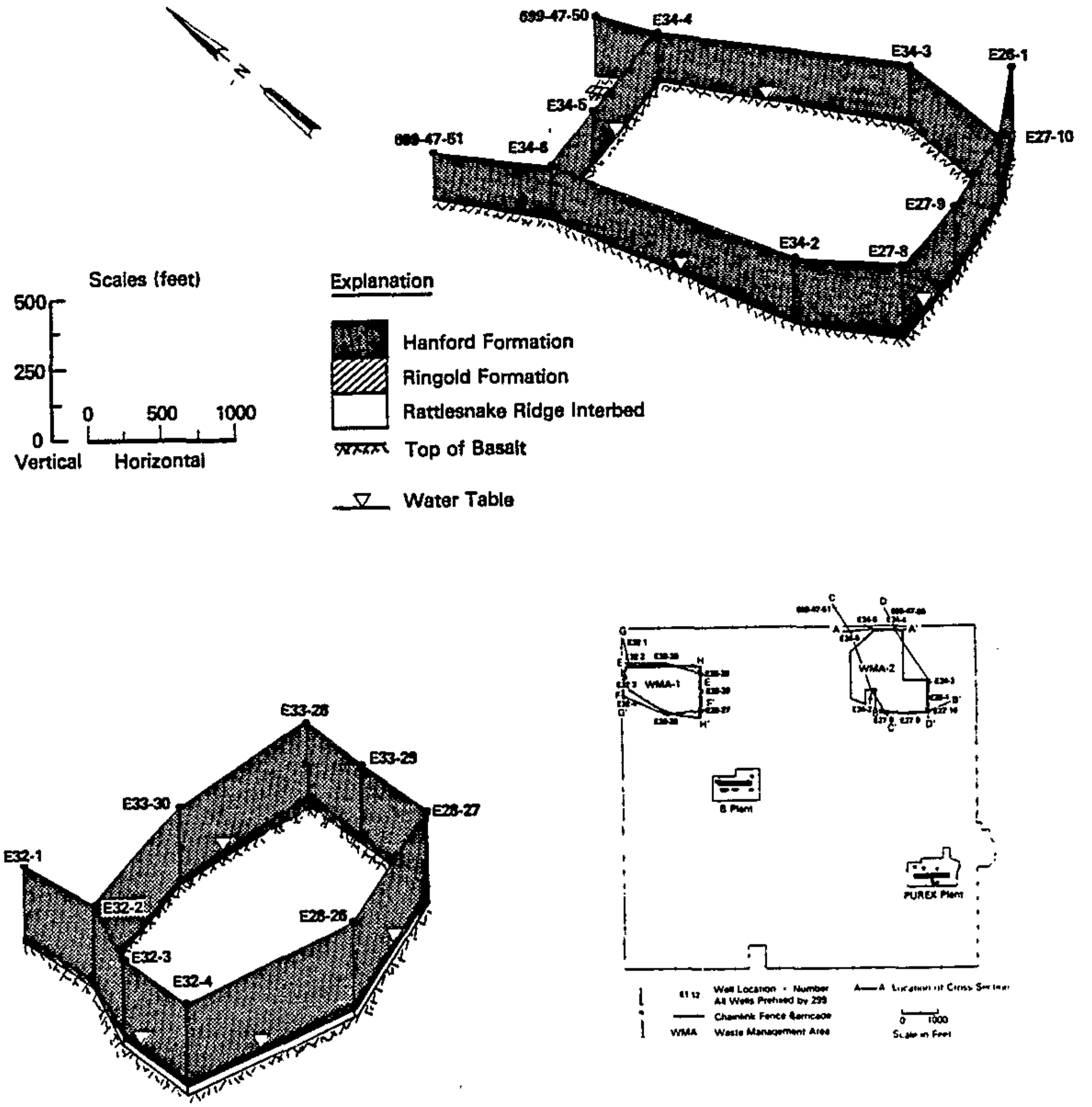

FIGURE 9. Fence Diagrams for Geologic Units Beneath the 200-East Area

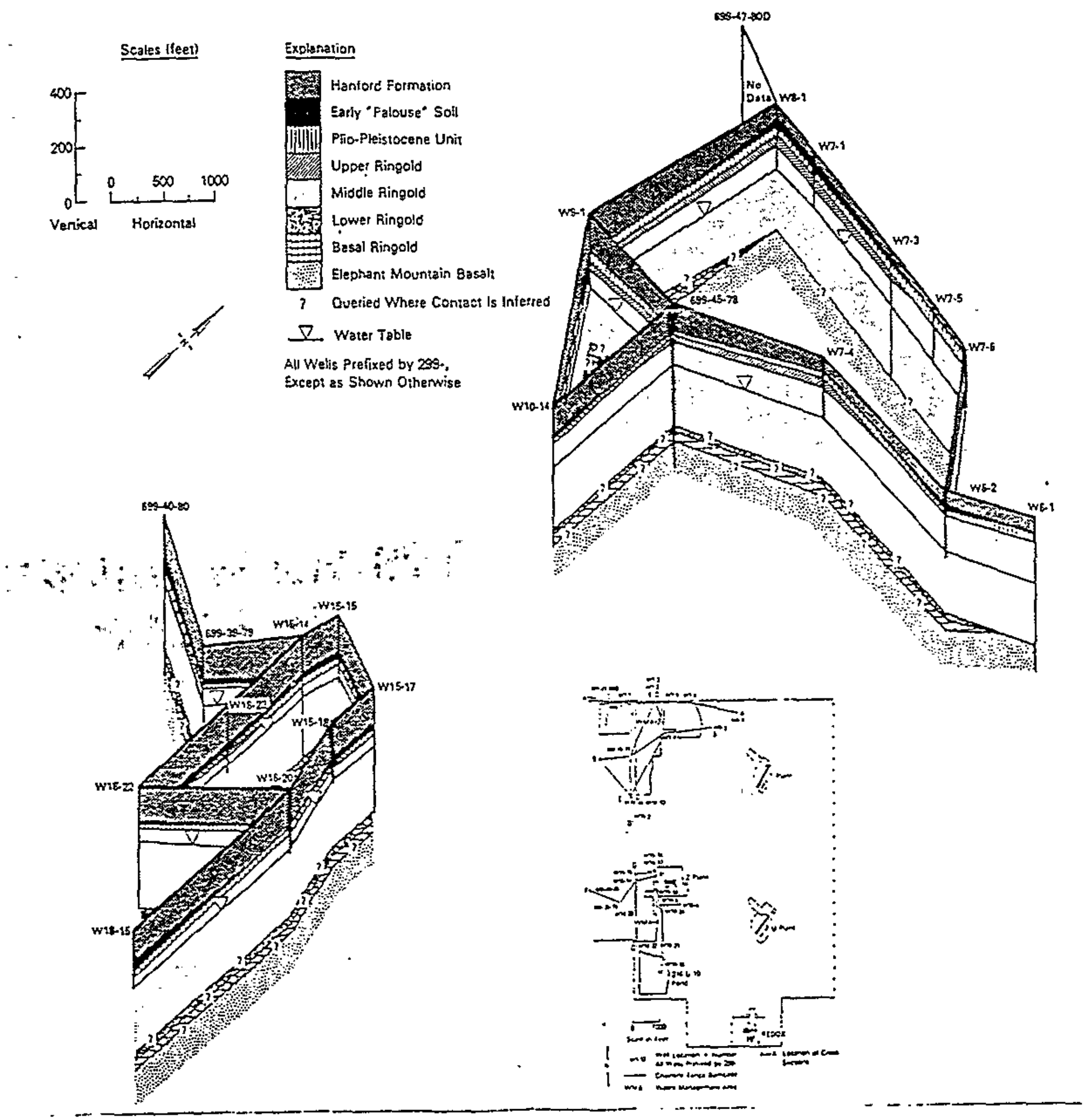

FIGURE 10. Fence Diagrams for Geologic Units Beneath the Northern and Western Portions of the 200-West Area

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TABLE 7. Summary of Preliminary Aquifer Test Results for 200-East Area Wells

Well Number	Screened Interval Tested, ft	Formation	Height of Water Column/ Aquifer Thickness, ft	Transmissivity, ft^2/d	Hydraulic Conductivity, ft/d	Date Tested
299-E27-8	247 to 257	Hanford	26.9/26.9	320,000 to 430,000	12,000 to 16,000	8/19/87
299-E27-9	233.4 to 244.3	Hanford	22.9/22.9	37,000	1,600	8/15/87
299-E27-10	229.1 to 240.1	Hanford	23.2/23.2	35,000	1,500	8/11/87
299-E28-26	315.1 to 325.1	Hanford/ Ringold	46/46	--	--	None
299-E28-27	291.2 to 301.4	Hanford	33/33	300,000 to 400,000	9,000 to 12,000	9/29/87
299-E32-2	279.2 to 289.2	Hanford	23.7/23.7	160,000 to 210,000	7,000 to 9,000	9/08/87
299-E32-3	291 to 301	Ringold	38/38	4,000 to 5,600	100 to 150	9/02/87
299-E32-4	298 to 308.2	Ringold	35/35	400 to 2,000	10 to 60	9/21/87
299-E33-28	268 to 278.3	Hanford	26/26	500,000 to 670,000	20,000 to 25,000	10/21/87
299-E33-29	279.5 to 289.5	Hanford	23.3/23.3	240,000 to 320,000	10,000 to 14,000	9/17/87
299-E33-30	266.8 to 277	Hanford	20/20	1.6E+6 to 2.14E+6	80,000 to 100,000	9/24/87
299-E34-2	230.2 to 240.4	Hanford	19.3/19.3	40,000 to 100,000	2,000 to 5,000	8/07/87
299-E34-3	203.5 to 213.8	Hanford	9.2/9.2	10,000 to 20,000	1,000 to 2,000	8/05/87
299-E34-4	None	Hanford	--	--	--	None
299-E34-5	180.5 to 190.5	Hanford	7.1/7.1	1,600 to 2,200	200 to 300	7/21/87
299-E34-6	None	Hanford	2.5/2.5	--	--	None

TABLE 8. Summary of Preliminary Aquifer Test Results for 200-West Area Wells

Well Number	Screened Interval Tested, ft	Formation	Height of Water Column/ Aquifer Thickness, ft	Transmissivity, ft^2/d	Hydraulic Conductivity, ft/d	Date Tested
299-W6-2	238 to 248	Ringold	20.4/195	250 to 860	1.3 to 4.4	11/05/87
299-W7-1	233 to 243	Ringold	17.3/265	1,200 to 1,500	4.5 to 5.7	7/15/87
299-W7-2	212 to 222	Ringold	10.1/258	500	2	9/16/87
299-W7-3	467 to 477	Ringold/ Basalt	263/258	<1	<0.004	10/30-31/87
299-W7-4	223 to 233	Ringold	27.9/205	3,000 to 3,300	1.5 to 1.6	11/12/87
299-W7-5	208 to 228	Ringold	18.3/250	40 to 130	0.16 to 0.52	11/21/87
299-W7-6	231 to 241	Ringold	25.9/240	10 to 100	0.042 to 0.42	10/14/87
299-W8-1	257 to 267	Ringold	30.9/270	25 to 90	0.093 to 0.33	7/11/87
299-W9-1	266 to 286	Ringold	16.9/215	--	--	10/23/87
299-W10-13	227.5 to 237.5	Ringold	8.5/217	600 to 3,500 (obs - pumped)	3 to 16	9/14/87
299-W10-14	437 to 447	Ringold	216/216	100	0.5	10/26/87
299-W15-15	245 to 255	Ringold	29.5/225	100 to 150	0.44 to 0.67	8/21/87
299-W15-16	227.5 to 237.5	Ringold	25.7/231	8,600 to 10,000 (obs - pumped)	37 to 43	8/20/87
299-W15-17	422.5 to 432.5	Ringold	230/230	<30	<0.1	9/28/87
299-W15-18	232 to 242	Ringold	27/235	14,000	62	7/21/87
299-W18-21	215.5 to 225.5	Ringold	30/251	1,500 to 50,000	6 to 200	7/14/87
299-W18-22	437.5 to 447.5	Ringold	250/250	300 to 500	1 to 2	8/26/87
299-W18-23	241 to 251	Ringold	26.8/235	30,000	130	6/22/87
299-W18-24	230 to 240	Ringold	29.8/240	23,500 to 44,000 (obs - pumped)	96 to 180	7/17/87

obs - obsolete.

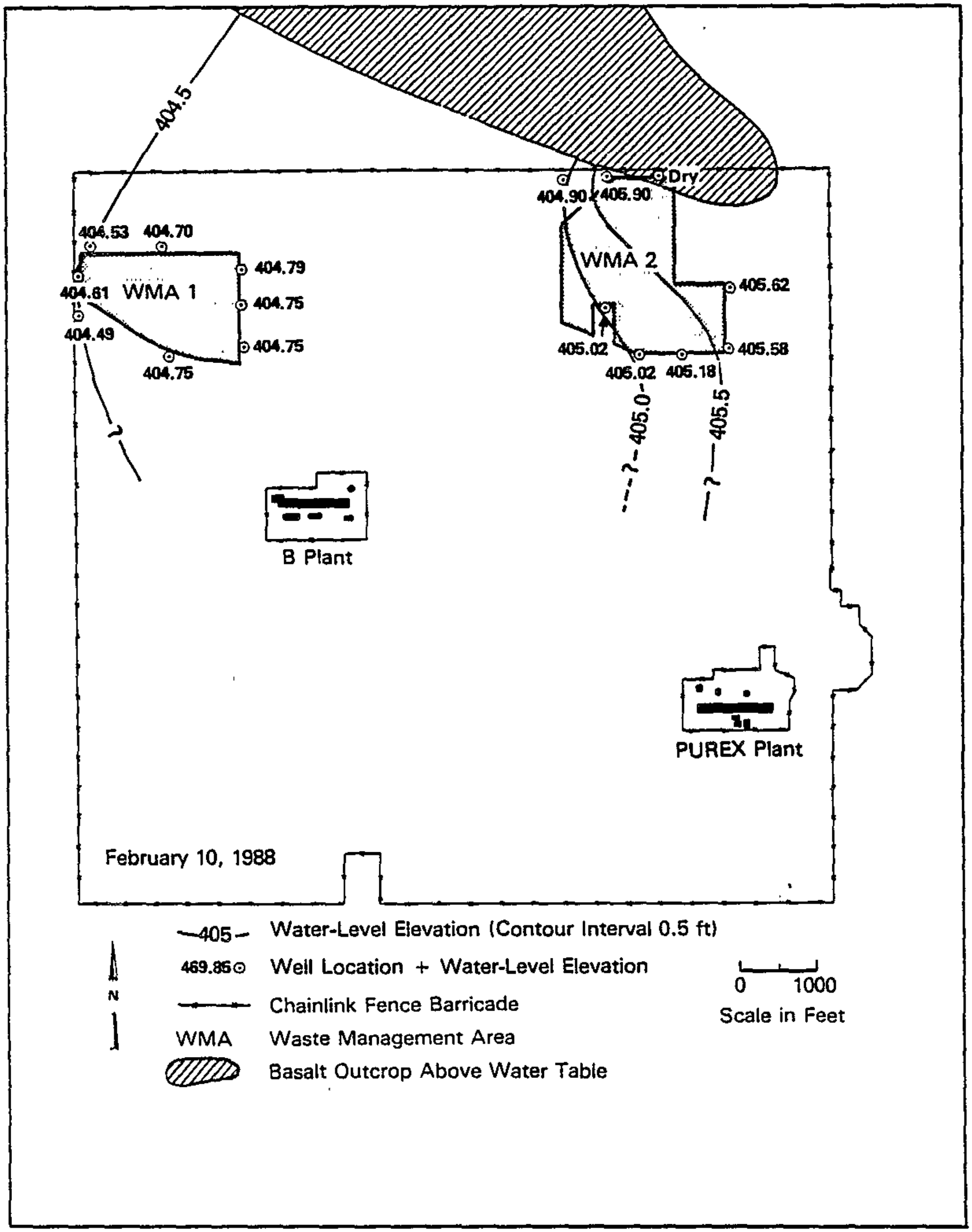

FIGURE 11. Water-Table Map for the Northern Portion of the 200-East Area as Measured on February 10 and 12, 1988

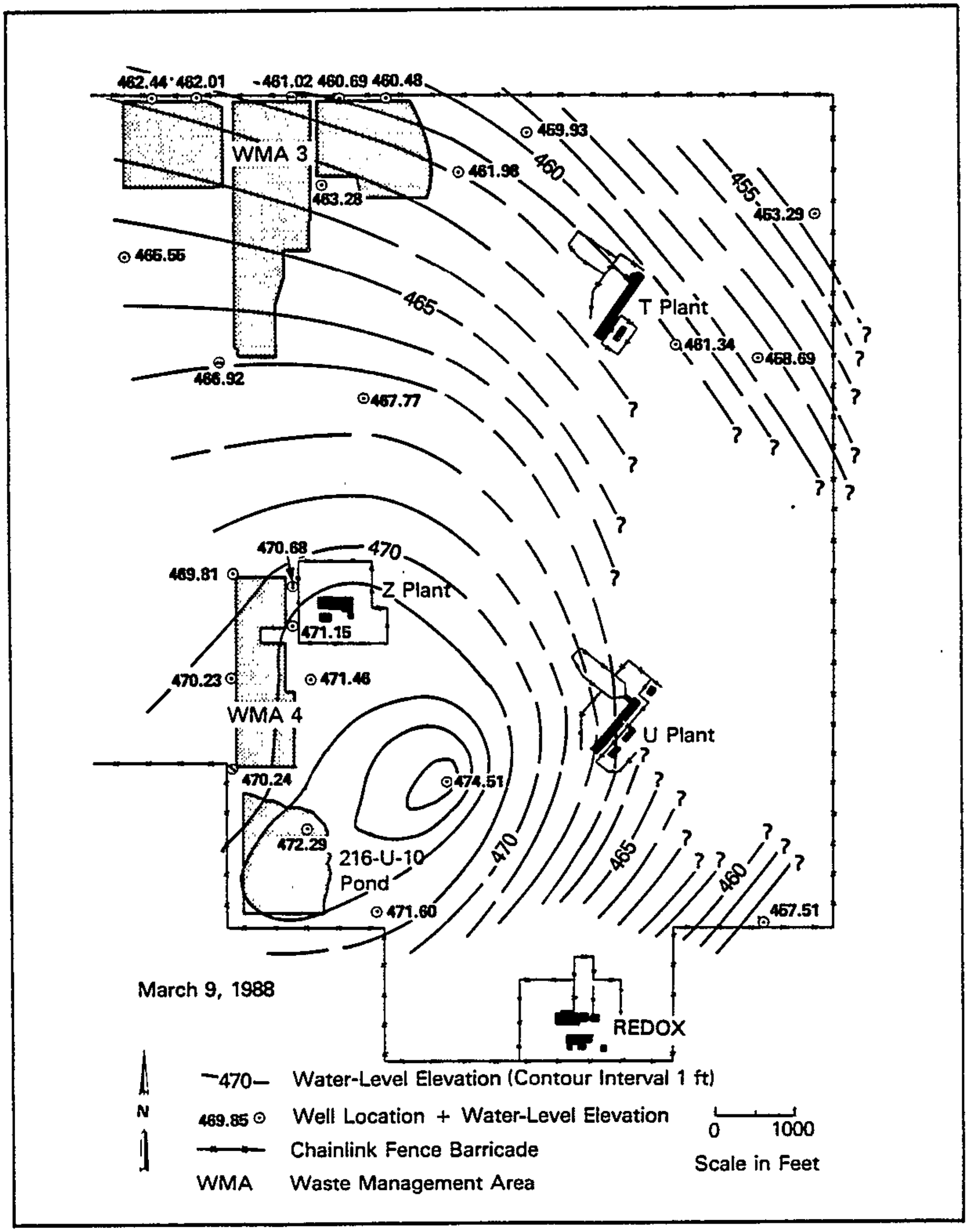

FIGURE 12. Water-Table Map for the Western Portion of the 200-West Area as Measured on February 11 and 12, 1988

NONRADIOACTIVE DANGEROUS WASTE LANDFILL

R. M. Fruland and D. J. Bates

Activities conducted in this reporting period include completion of quarterly sampling and analysis at the Nonradioactive Dangerous Waste Landfill (NRDW). This is the sixth quarterly sampling for the five shallow wells completed in the top of the unconfined aquifer, and the fifth quarterly sampling for the two deep monitoring wells completed just above the first confining layer. The data presented here will be statistically analyzed in accordance with 40 CFR 265.93(b) (EPA 1984) to determine if significant differences exist between background concentrations and this quarter's data from both upgradient and downgradient wells. The NRDW together with the Solid Waste Landfill (SWL) comprise the Hanford Site Central Landfill (CLF). Well locations are shown in Figure 13.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No additional drilling and hydrogeologic activities were conducted during this quarter.

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

All seven ground-water monitoring wells at the NRDW were sampled in January 1988. Field measurements, including temperature, conductivity, and pH were made at the same time the water samples were collected. Water-table elevations were not measured; elevations will be measured in the future before each sampling. Monthly water-table elevation measurements will be collected during the third and fourth quarters at NRDW, SWL, and nearby Hanford Site wells. These additional water-elevation data should aid in more accurate determination of the direction of ground-water flow.

Table 9 presents a summary of the analytical data collected this quarter, including field and laboratory measurements of pH and conductivity. Statistical analyses of one of the indicator parameters, pH, suggests that there may be a problem with this measurement. An evaluation is under way of the field and laboratory measurements for pH and conductivity. Field measurements and sample collection were accomplished over a 4-day time span,

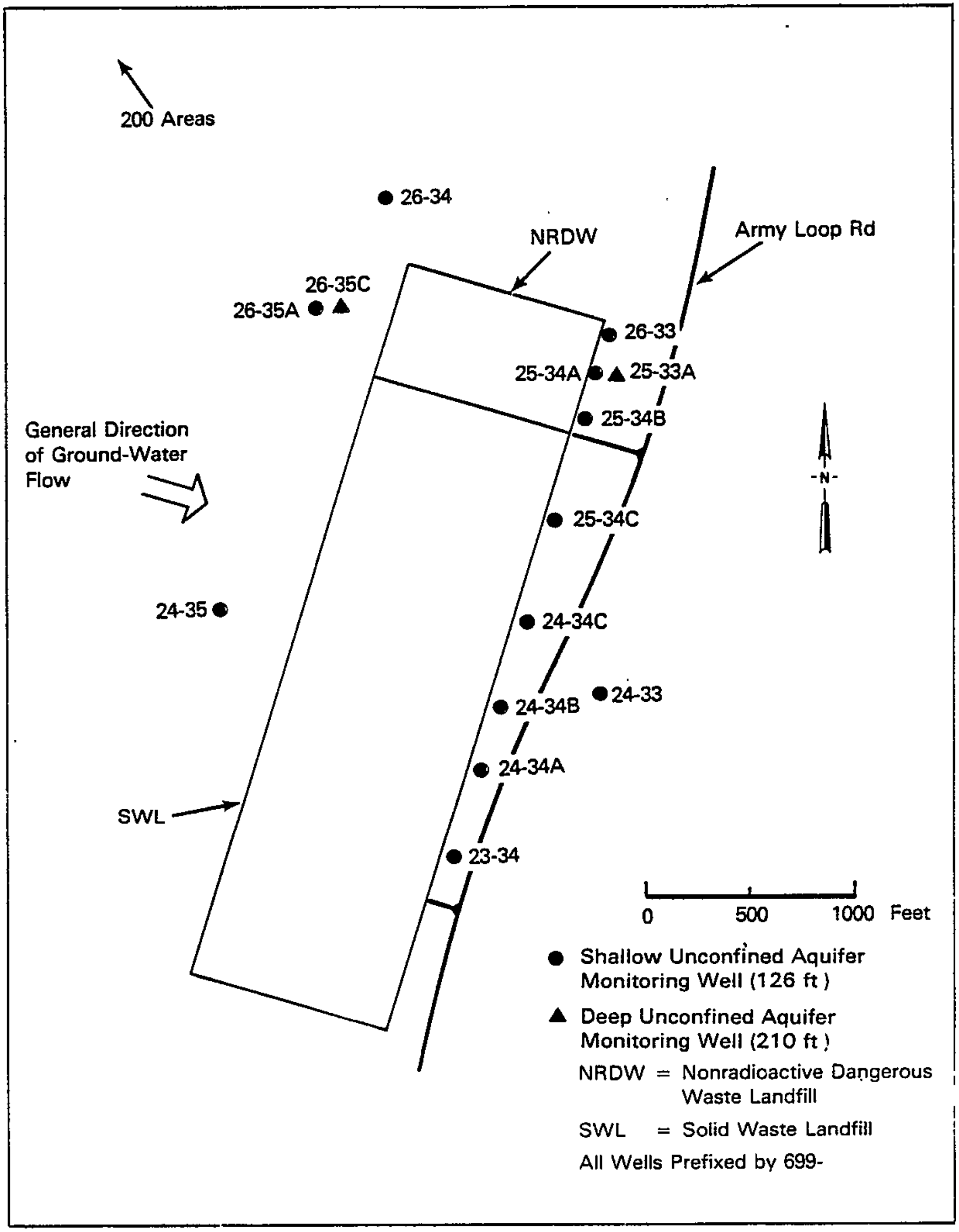

FIGURE 13. Well Locations for the Hanford Site Central Landfill that Includes the Solid Waste Landfill and the Nonradioactive Dangerous Waste Landfill

TABLE 9. Sample Summary for the Nonradioactive Dangerous Waste Landfill, December 1987 and January, February 1988

-- Constituent List=Contamination Indicator Parameters --

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
088	CONDLAB	UMHO	.	28	0		700	WACS		Specific conductance, laboratory
191	CONDFLD	UMHO	1	28	0		700	WACS		Specific conductance, field
199	PHFIELD		0.1	28	0		6.5-8.5	EPAS		pH, field
207	PH-LAB		0.01	28	0		6.5-8.5	EPAS		pH, laboratory
C69	TOC	PPB	1000	28	0		.			Total organic carbon
H42	TOXLDL	PPB	20	28	1		.			Total organic halogens, low DL

-- Constituent List=Drinking Water Parameters --

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	4	4	***	1	EPA		Coliform bacteria
111	BETA	PCI/L	8	7	0		50	EPA		Gross beta
212	ALPHA	PCI/L	4	7	0		15	EPA		Gross alpha
A06	BARIUM	PPB	6	7	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	7	7	***	10	EPA		Cadmium
A08	CHROMUM	PPB	10	7	6		50	EPA		Chromium
A10	SILVER	PPB	10	7	7	***	50	EPA		Silver
A20	ARSENIC	PPB	5	7	6		50	EPA		Arsenic
A21	MERCURY	PPB	0.1	7	7	***	2	EPA		Mercury
A22	SELENUM	PPB	5	7	7	***	10	EPA		Selenium
A61	LEADGF	PPB	5	7	6		50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	7	0		45000	EPA		Nitrate
C74	FLUORID	PPB	500	7	0		4000	EPA		Fluoride
H20	FBARIUM	PPB	6	7	0		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	7	7	***	10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	7	7	***	50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	7	7	***	50	EPA		Silver, filtered
H38	FMERCUR	PPB	0.1	7	7	***	2	EPA		Mercury, filtered
H63	LFLUORD	PPB	20	7	0		4000	EPA		Fluoride, low DL

-- Constituent List=Water Quality Parameters --

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A11	SODIUM	PPB	200	7	0		.			Sodium
A17	MANGESE	PPB	5	7	5		50	EPAS	xxx	Manganese
A19	IRON	PPB	30	7	5		300	EPAS		Iron
C73	SULFATE	PPB	500	7	0		250000	EPAS		Sulfate
C75	CHLORID	PPB	500	7	0		250000	EPAS		Chloride
H24	FSODIUM	PPB	200	7	0		.			Sodium, filtered
H29	FMANGAN	PPB	5	7	5		50	EPAS	xxx	Manganese, filtered
H31	FIRON	PPB	30	7	6		300	EPAS		Iron, filtered
H67	LPHENOL	PPB	10	7	7	***	.			Phenol, low DL

TABLE 9. (contd)

-- Constituent List=Site Specific and Other Parameters --

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A01	BERYLUM	PPB	5	7	7	***	.			Beryllium
A03	STRONUM	PPB	20	7	0		.			Strontium
A04	ZINC	PPB	5	7	7	***	5000	EPAS		Zinc
A05	CALCIUM	PPB	50	7	0		.			Calcium
A12	NICKEL	PPB	10	7	7	***	.			Nickel
A13	COPPER	PPB	10	7	6		1300	EPAP		Copper
A14	VANADUM	PPB	5	7	0		.			Vanadium
A15	ANTIONY	PPB	100	7	7	***	.			Antimony
A16	ALUMNUM	PPB	150	7	7	***	.			Aluminum
A18	POTASUM	PPB	100	7	0		.			Potassium
A50	MAGNES	PPB	50	7	0		.			Magnesium
A61	TETRANE	PPB	5	7	7	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	PPB	5	7	7	***	5	EPA		Benzene
A63	DIOXANE	PPB	500	7	7	***	.			Dioxane
A64	METHONE	PPB	10	7	7	***	.			Methyl ethyl ketone
A65	PYRIDIN	PPB	500	7	7	***	.			Pyridine
A66	TOLUENE	PPB	5	7	7	***	2000	EPAP		Toluene
A67	1,1,1-T	PPB	5	7	7	***	200	EPA		1,1,1-trichloroethane
A68	1,1,2-T	PPB	5	7	7	***	.			1,1,2-trichloroethane
A69	TRICENE	PPB	5	7	7	***	5	EPA		Trichloroethylene [1,1,2-trichloroethene
A70	PERCENE	PPB	5	7	7	***	.			Perchloroethylene
A71	OPXYLE	PPB	5	7	7	***	440	EPAP		Xylene-o,p
A72	ACROLIN	PPB	10	7	7	***	.			Acrolein
A73	ACRYILE	PPB	10	7	7	***	.			Acrylonitrile
A74	BISTHER	PPB	10	7	7	***	.			Bis(chloromethyl) ether
A75	BROMONE	PPB	10	7	7	***	.			Bromoacetone
A76	METHBRO	PPB	10	7	7	***	.			Methyl bromide
A77	CARBIDE	PPB	10	7	7	***	.			Carbon disulfide
A78	CHLBENZ	PPB	10	7	7	***	60	EPAP		Chlorobenzene
A79	CHLTHER	PPB	10	7	7	***	.			2-chloroethyl vinyl ether
A80	CHLFORM	PPB	5	7	7	***	100	EPA		Chloroform [Trichloromethane]
A81	METHCHL	PPB	10	7	7	***	.			Methyl chloride [Chloromethane]
A82	CHMTHER	PPB	10	7	7	***	.			Chloromethyl methyl ether
A83	CROTONA	PPB	10	7	7	***	.			Crotonaldehyde
A84	DIBRCHL	PPB	10	7	7	***	0	EPAP		1,2-dibromo-3-chloropropane
A85	DIBRETH	PPB	10	7	7	***	.			1,2-dibromoethane
A86	DIBRMET	PPB	10	7	7	***	.			Dibromomethane
A87	DIBUTEN	PPB	10	7	7	***	.			1,4-dichloro-2-butene
A88	DICDIFM	PPB	10	7	7	***	.			Dichlorodifluoromethane
A89	1,1-DIC	PPB	10	7	7	***	.			1,1-dichloroethane
A90	1,2-DIC	PPB	10	7	7	***	5	EPA		1,2-dichloroethane
A91	TRANDCE	PPB	10	7	7	***	70	EPAP		Trans-1,2-dichloroethene
A92	DICETHY	PPB	10	7	7	***	7	EPA		1,1-dichloroethylene
A93	METHYCH	PPB	10	7	7	***	.			Methylene chloride
A94	DICPANE	PPB	10	7	7	***	6	EPAP		1,2-dichloropropane
A95	DICPENE	PPB	10	7	7	***	.			1,3-dichloropropene
A96	NNDIEHY	PPB	10	7	7	***	.			N,N-diethylhydrazine
A99	HYDRSUL	PPB	10	7	7	***	.			Hydrogen sulfide

TABLE 9. (contd)

-- Constituent List=Site Specific and Other Parameters ---------------------------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
B01	IODOMET	PPB	10	7	7	***	.			Iodomethane
B02	METHACR	PPB	10	7	7	***	.			Methacrylonitrile
B03	METHTHI	PPB	10	7	7	***	.			Methanethiol
B04	PENTACH	PPB	10	7	7	***	.			Pentachloroethane
B05	1112-tc	PPB	10	7	7	***	.			1,1,1,2-tetrachlorethane
B06	1122-tc	PPB	10	7	7	***	.			1,1,2,2-tetrachlorethane
B08	BROMORM	PPB	10	7	7	***	100	EPA		Bromoform [Tribromomethane]
B09	TRCMEOL	PPB	10	7	7	***	.			Trichloromethanethiol
B10	TRCMFLM	PPB	10	7	7	***	.			Trichloromonofluoromethane
B11	TRCPANE	PPB	10	7	7	***	.			Trichloropropane
B12	123-trp	PPB	10	7	7	***	.			1,2,3-trichloropropane
B13	VINYIDE	PPB	10	7	7	***	2	EPA		Vinyl chloride
B14	M-XYLE	PPB	5	7	7	***	440	EPAP		Xylene-m
B15	DIETHY	PPB	10	7	7	***	.			Diethylarsine
B19	ACETILE	PPB	3000	7	7	***	.			Acetonitrile
C04	METACRY	PPB	10	7	7	***	.			Methyl methacrylate
C71	FORMALN	PPB	500	7	7	***	.			Formalin
C78	PHOSPHA	PPB	1000	7	7	***	.			Phosphate
H05	ETHOXID	PPB	3000	7	7	***	.			Ethylene oxide
H06	ETHMETH	PPB	10	7	7	***	.			Ethyl methacrylate
H16	TC	PPB	1000	7	0		.			Total carbon
H17	TDS	PPB	5000	7	0		500000	EPAS		Total dissolved solids
H18	FZINC	PPB	5	7	7	***	5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	7	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	7	7	***	.			Nickel, filtered
H26	FCOPPER	PPB	10	7	7	***	1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	7	0		.			Vanadium, filtered
H28	FALUMIN	PPB	150	7	7	***	.			Aluminum, filtered
H30	FPOTASS	PPB	100	7	0		.			Potassium, filtered
H32	FMAGNES	PPB	50	7	0		.			Magnesium, filtered
H33	FBERYLL	PPB	5	7	7	***	.			Beryllium, filtered
H35	FSTRONT	PPB	20	7	0		.			Strontium, filtered
H36	FANTIMO	PPB	100	7	7	***	.			Antimony, filtered
H58	ALKALIN	PPB	20000	7	0		.			Total alkalinity, as CaCO3
H68	HEXONE	PPB	10	7	7	***	.			Hexone

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986)
National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

which may be reflected in some of the variations in the measurements. Good agreement exists between the field and laboratory conductivity data for two wells; generally closer agreement exists between field and laboratory pH measurements. Table 10 contains the raw data for constituents that had at least one value reported above the detection limit.

The downgradient deep well continues to show a pattern of low beta and nitrate concentrations compared with all the other NRDW wells, including the upgradient deep well (see Table 10). Ground-water composition of the deep downgradient well also has lower calcium and higher sodium concentrations relative to the upgradient deep well and the shallow wells.

STATISITCAL ANALYSIS

As stated in the last quarterly report (PNL 1988), several of the contamination-indicator parameters showed a significant change in the October through November sampling (i.e., the first quarter of results obtained after a 1-year effort to obtain background data). Under these conditions, 40 CFR 265.93(b) (EPA 1984) requires that downgradient wells that showed significant differences be resampled for verification purposes. Because the results of the statistical analysis for the October through November data were not available until just before the next scheduled quarterly sampling at the NRDW, the regular quarterly results obtained in January 1988 were used in place of special samples to meet the requirements of resampling.

Table 11 contains summaries of the replicate contamination-indicator parameters for the January 1988 samples at the NRDW. Table 12 contains critical mean values obtained for the NRDW from data that were collected for the first year to establish background values. The methodology used to establish these background values was reported in the RCRA annual report (PNL 1988b). Comparison of the replicate averages for the January samples against the critical mean values show the following:

- None of the wells that exceeded the critical mean values in the October through November 1987 samples were statistically significant in the January 1988 sample.

TABLE 10. Constituents with at Least One Detected Value from Wells Near the Nonradioactive Dangerous Waste Landfill, January 1988

Quadruplicates of Contamination Indicator Parameters

Well name	Collection Date	Duplicate sample number	CONDFLD UMHO 700*	CONDLAB UMHO 700*	PH-LAB *	PHFIELD *	TOC PPB *	TOXLDL PPB *
6-25-33A	15JAN88		273	406	7.99	8.2	#261	#10.8
	15JAN88	1	272	292	8.06	8.2	#250	#12.6
	15JAN88	2	272	292	8.04	8.2	#212	48.0
	15JAN88	3	271	297	8.02	8.2	#233	#9.8
6-25-34A	15JAN88		270	406	7.78	7.9	#394	#14.9
	15JAN88	1	269	302	7.92	7.9	#307	#5.2
	15JAN88	2	269	302	7.90	8.0	#340	#9.7
	15JAN88	3	269	297	7.83	8.0	#442	#9.5
6-25-34B	18JAN88		406	396	7.63	5.8	#377	28.3
	18JAN88	1	406	396	7.66	5.8	#370	#2.2
	18JAN88	2	406	406	7.70	5.8	#365	#5.7
	18JAN88	3	406	406	7.72	5.9	#323	#6.2
6-26-33	15JAN88		255	401	7.92	8.1	#294	25.2
	15JAN88	1	254	281	7.98	8.1	#312	#19.4
	15JAN88	2	254	292	7.95	8.1	#355	#14.1
	15JAN88	3	254	292	7.93	8.1	#331	26.8
6-26-34	20JAN88		341	396	7.70	7.8	#318	#1.1
	20JAN88	1	340	396	7.72	7.8	#333	#2.5
	20JAN88	2	341	396	7.70	7.8	#456	#20.0
	20JAN88	3	341	396	7.73	7.8	#310	#1.2
6-26-35A	18JAN88		394	396	7.83	5.4	#295	#6.4
	18JAN88	1	394	396	7.83	5.4	#279	#5.4
	18JAN88	2	394	396	7.84	5.4	#416	#3.8
	18JAN88	3	394	406	7.85	5.4	#347	#9.8
6-26-35C	19JAN88		362	459	7.77	7.6	#181	#9.5
	19JAN88	1	362	459	7.79	7.6	#222	#4.3
	19JAN88	2	362	459	7.86	7.6	#212	#3.0
	19JAN88	3	361	459	7.86	7.6	#314	#2.4

TABLE 10. (contd)

Well name	Collection Date	Duplicate sample number	ALKALIN PPB .	ALPHA PCI/L 15	ARSENIC PPB 50	BARIUM PPB 1000	FBARIUM PPB 1000	BETA PCI/L 50	FCALCIU PPB .	CALCIUM PPB .
6-25-33A	15JAN88		129,000	2.350	<5	30	26	5.94	35,500	34,900
6-25-34A	15JAN88		119,000	*0.572	<5	38	34	33.60	39,600	38,700
6-25-34B	18JAN88		123,000	3.790	<5	38	33	31.00	41,400	42,200
6-26-33	15JAN88		112,000	2.450	<5	37	33	28.70	37,700	37,300
6-26-34	20JAN88		108,000	2.070	7	27	32	27.60	36,000	35,800
6-26-35A	18JAN88		117,000	3.490	<5	30	31	27.70	39,800	38,300
6-26-35C	19JAN88		122,000	*0.832	<5	50	52	26.00	46,000	44,700

Well name	Collection Date	Duplicate sample number	CHLORID PPB 250000*	CHROMUM PPB 50	COPPER PPB 1300*	FLUORID PPB 4000	IRON PPB 300*	FIRON PPB 300*	LEADGF PPB 50	LFLUORD PPB 4000
6-25-33A	15JAN88		7,010	<10	30	672	132	30	5	496
6-25-34A	15JAN88		7,080	<10	<10	705	<30	<30	<5	588
6-25-34B	18JAN88		7,060	<10	<10	684	<30	<30	<5	620
6-26-33	15JAN88		6,720	<10	<10	712	<30	<30	<5	614
6-26-34	20JAN88		7,700	<10	<10	730	<30	<30	<5	632
6-26-35A	18JAN88		7,680	<10	<10	673	<30	<30	<5	560
6-26-35C	19JAN88		8,750	10	<10	532	66	<30	<5	436

Well name	Collection Date	Duplicate sample number	MAGNES PPB .	FMAGNES PPB .	FMANGAN PPB 50*	MANGESE PPB 50*	NITRATE PPB 45000	FPOTASS PPB .	POTASUM PPB .	SODIUM PPB .
6-25-33A	15JAN88		9,420	9,380	7	5	5,830	5,360	5,430	31,800
6-25-34A	15JAN88		10,900	11,100	<5	<5	30,900	6,010	5,930	22,000
6-25-34B	18JAN88		11,200	11,100	<5	<5	30,700	5,720	5,560	20,300
6-26-33	15JAN88		10,200	10,500	<5	<5	29,100	5,780	5,390	20,300
6-26-34	20JAN88		10,400	10,400	<5	<5	31,000	5,980	6,110	24,200
6-26-35A	18JAN88		11,100	11,100	<5	<5	30,000	5,780	6,350	23,100
6-26-35C	19JAN88		11,900	12,100	91	90	20,800	5,930	5,960	20,700

Well name	Collection Date	Duplicate sample number	FSODIUM PPB .	FSTRONT PPB .	STRONUM PPB .	SULFATE PPB 250000*	TC PPB .	TDS PPB 500000*	FVANADI PPB .	VANADUM PPB .
6-25-33A	15JAN88		30,200	207	212	48,600	30,200	247,000	10	10
6-25-34A	15JAN88		22,800	178	177	38,900	27,800	146,000	25	24
6-25-34B	18JAN88		21,000	180	184	38,700	29,300	272,000	24	23
6-26-33	15JAN88		22,200	170	169	37,100	25,900	245,000	26	27
6-26-34	20JAN88		23,400	162	164	40,000	27,200	262,000	21	24
6-26-35A	18JAN88		21,200	178	179	41,400	27,700	267,000	24	18
6-26-35C	19JAN88		20,600	229	232	60,600	29,800	281,000	8	11

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable
* - Less than 2-sigma counting error for radionuclides

TABLE 11. Replicate Summaries for Contamination-Indicator Parameters for the Nonradioactive Dangerous Waste Landfill, January 1988

Constituent Code Name Units	Well Name	Sample Date	Reps	Replicate Average	Standard Deviation	Minimum	Maximum	Coefficient of Variation
088 CONDLAB UMHO	6-25-33A	15JAN88	4	322	56.2	292	406	17.5
	6-25-34A	15JAN88	4	327	52.9	297	406	16.2
	6-25-34B	18JAN88	4	401	5.77	396	406	1.4
	6-26-33	15JAN88	4	317	56.6	281	401	17.9
	6-26-34	20JAN88	4	396	0.00	396	396	0.0
	6-26-35A	18JAN88	4	399	5.00	396	406	1.3
	6-26-35C	19JAN88	4	459	0.00	459	459	0.0
191 CONDFLD UMHO	6-25-33A	15JAN88	4	272	0.82	271	273	0.3
	6-25-34A	15JAN88	4	269	0.50	269	270	0.2
	6-25-34B	18JAN88	4	406	0.00	406	406	0.0
	6-26-33	15JAN88	4	254	0.50	254	255	0.2
	6-26-34	20JAN88	4	341	0.50	340	341	0.1
	6-26-35A	18JAN88	4	394	0.00	394	394	0.0
	6-26-35C	19JAN88	4	362	0.50	361	362	0.1
199 PHFIELD	6-25-33A	15JAN88	4	8.20	0.00	8.2	8.2	0.0
	6-25-34A	15JAN88	4	7.95	0.06	7.9	8.0	0.7
	6-25-34B	18JAN88	4	5.82	0.05	5.8	5.9	0.9
	6-26-33	15JAN88	4	8.10	0.00	8.1	8.1	0.0
	6-26-34	20JAN88	4	7.80	0.00	7.8	7.8	0.0
	6-26-35A	18JAN88	4	5.40	0.00	5.4	5.4	0.0
	6-26-35C	19JAN88	4	7.60	0.00	7.6	7.6	0.0
207 PH-LAB	6-25-33A	15JAN88	4	8.03	0.030	7.99	8.06	0.4
	6-25-34A	15JAN88	4	7.86	0.065	7.78	7.92	0.8
	6-25-34B	18JAN88	4	7.68	0.040	7.63	7.72	0.5
	6-26-33	15JAN88	4	7.94	0.027	7.92	7.98	0.3
	6-26-34	20JAN88	4	7.71	0.015	7.70	7.73	0.2
	6-26-35A	18JAN88	4	7.84	0.010	7.83	7.85	0.1
	6-26-35C	19JAN88	4	7.82	0.047	7.77	7.86	0.6
C69 TOC PPB	6-25-33A	15JAN88	4	239	21.4	212	261	8.9
	6-25-34A	15JAN88	4	371	59.5	307	442	16.1
	6-25-34B	18JAN88	4	359	24.3	323	377	6.8
	6-26-33	15JAN88	4	323	26.1	294	355	8.1
	6-26-34	20JAN88	4	354	68.5	310	456	19.3
	6-26-35A	18JAN88	4	334	61.7	279	416	18.5
	6-26-35C	19JAN88	4	232	57.2	181	314	24.6
H42 TOXLDL PPB	6-25-33A	15JAN88	4	20.3	18.5	9.8	48.0	91.1
	6-25-34A	15JAN88	4	9.82	3.97	5.2	14.9	40.4
	6-25-34B	18JAN88	4	10.6	11.9	2.2	28.3	112.6
	6-26-33	15JAN88	4	21.4	5.80	14.1	28.8	27.1
	6-26-34	20JAN88	4	6.20	9.22	1.1	20.0	148.7
	6-26-35A	18JAN88	4	6.35	2.54	3.8	9.8	40.0
	6-26-35C	19JAN88	4	4.80	3.23	2.4	9.5	67.3

TABLE 12. Critical Mean Values Established from the First Year of Monitoring Data for the Nonradioactive Dangerous Waste Landfill

Contamination-Indicator Parameter	Number of Background Means	df(a)	tc(b)	Background Average	Background Standard Deviation	Critical Mean
191 Field Conductivity, μmho	11	10	4.809	359.6	32.6	523.1
199 Field pH	11	10	6.429	7.23	0.27	(5.44,9.02)
C69 Total Organic Carbon, ppb	11	10	4.809	314.8	138.6	1011
C68 Total Organic Halogen, ppb(c)	7	6	6.351	7.04	4.14	35.13

(a) df Degrees of freedom.
(b) tc Critical t value for statistical test.
(c) Calculated without July value in well 699-26-35C.

- Well 699-26-35A, with an average replicate value of 5.40, shows a statistically significant change when compared to the critical means for pH. However, because this is an upgradient well, no resampling for verification is required.

216-A-36B CRIB

S. P. Luttrell

The Washington State Department of Ecology (Ecology) imposed a Compliance Order (DE87-295) on November 2, 1987, requiring that the DOE be in physical compliance with 40 CFR 265, Subpart F, at the 216-A-36B Crib. The Compliance Order stated that wells must be in place, that ground-water sampling plans and procedures must be finalized, and that quarterly sampling of the system must be initiated by June 1, 1988.

This section discusses the general plans, status, and findings to date of drilling and constructing ground-water monitoring wells and hydrogeologic characterization at the 216-A-36B Crib. Also reported are discussions and agreements between WHC, PNL, and Ecology.

A draft ground-water monitoring plan for the 216-A-36B Crib was prepared and should be completed during the next quarter. A site safety plan for PNL personnel was prepared. A ground-water sampling and analysis plan will be prepared before ground-water sampling commences.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Five new wells will be drilled and constructed at the 216-A-36B Crib (Figure 14). Drilling started on March 10, 1988. The new wells (299-E17-14, 299-E17-15, 299-E17-16, 299-E17-17, and 299-E17-18) are discussed below.

The draft ground-water monitoring plan for the 216-A-36B Crib provides the plans for drilling and constructing wells, preliminary hydrogeologic characterization, and ground-water monitoring at the site. A summary of these plans was presented to Ecology on March 18, 1988. On March 21, 1988, Ecology requested that drilling activities cease until justification of well locations was presented. On March 21, 1988, personnel from WHC and PNL provided the justification for well locations, and Ecology verbally accepted the justification and agreed that drilling could continue.

Well Drilling Effort

The well specifications for constructing the five new wells are similar to those for other RCRA wells in the 200-East and 200-West Areas. The wells

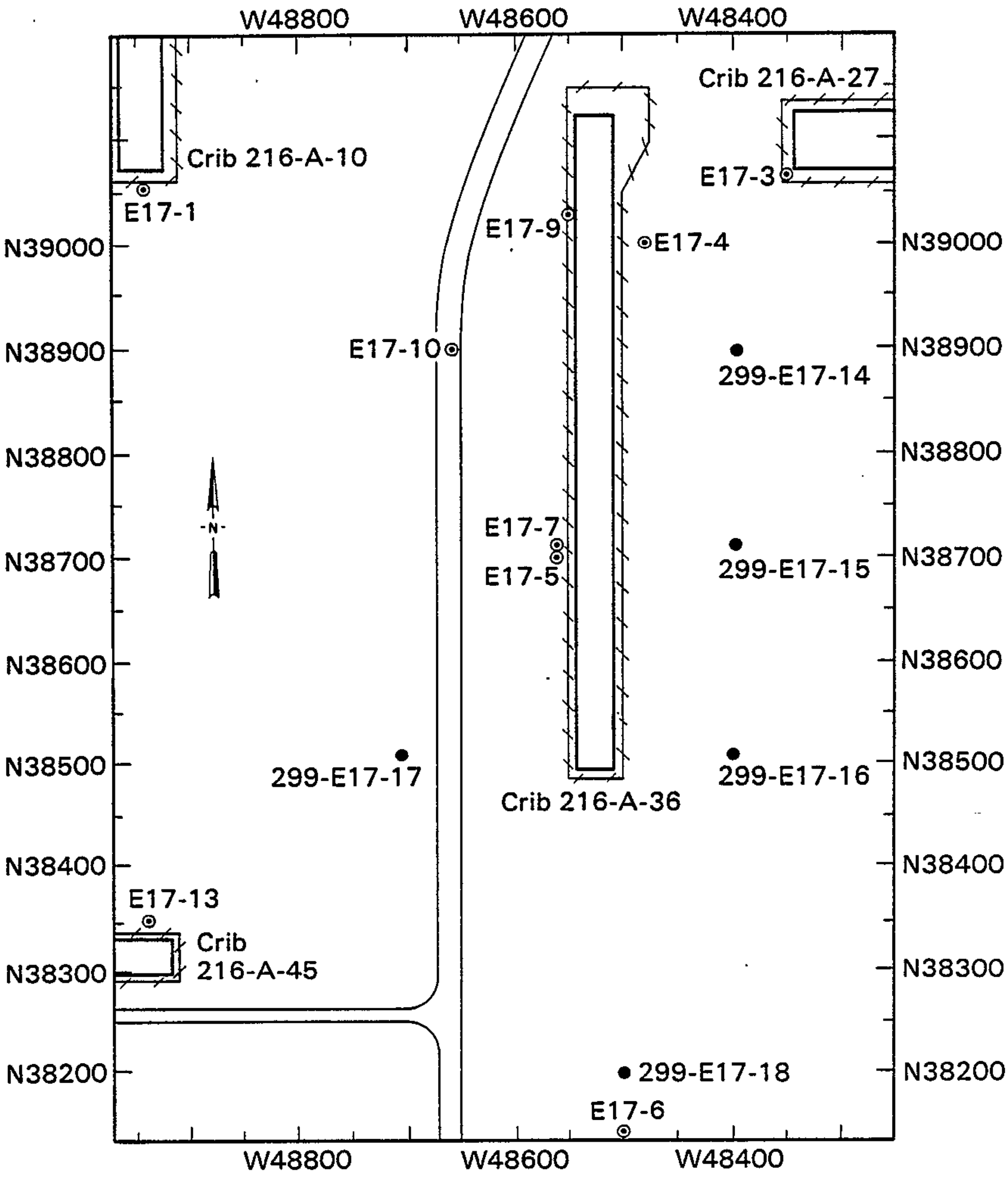

FIGURE 14. Locations of Ground-Water Monitoring Wells at the 216-A-36B Crib (new locations are indicated by solid bullets)

are drilled with a cable-tool drilling rig; temporary drive casing is installed during drilling and is withdrawn while the filter pack and annular seal materials (bentonite pellets and bentonite) are installed. The final well completions will consist of 4-in.-dia stainless steel screens and casings. The total depth of each well is expected to be approximately 335 ft.

An 8-in. telescoping stainless steel screen is planned to be placed in each well for the purpose of pumping to obtain preliminary aquifer property information. This screen will remain in place after the test, and the screened portion of the completed well will be constructed within the telescoping screen.

Lithologic samples are collected every 5 ft. Samples are analyzed for moisture content when appropriate (from drive-barrel samples where no water has been added). Samples are also collected at selected intervals for chemical analyses of the sediments. The following constituents will be analyzed and/or measured by WHC:

- water-extractable ammonium
- nitrate
- fluoride
- pH.

Radiation protection technologists survey the samples and tools for radiological contamination at least twice daily. Respiratory protection personnel also survey the vicinity of the boreholes (when requested) to evaluate potential health hazards related to inhalation and to make recommendations concerning worker respiratory protection.

The status of each well and important observations associated with drilling as of March 31, 1988, are indicated below.

Well 299-E17-14

Drilling commenced on March 22, 1988. The borehole was drilled to approximately 243 ft by March 31. A faint smell of ammonia was detected at approximately 95 ft. A photoionizer meter with an 11.7-eV probe indicated approximately 30 ppm ammonia at the borehole when the well was at the 100-ft level. The ammonia concentration was approximately 30 ppm and was measured with a calorimetric detector tube at depths of 101 and 103 ft on March 24. Between 104 and 150 ft, a slight ammonia smell was detected. The source of this ammonia is that which has been discharged to the 216-A-36B Crib.

A detector tube was used on March 29 when the well was at a depth of 150 ft, and approximately 400 ppm ammonia were indicated by WHC respiratory protection personnel. The driller utilized a respirator and fresh air while working near the casing (welding, cutting) for the remainder of the day. The following day, when a high-pressure atmospheric system was in the area, (March 30) no ammonia was detected. No one smelled or otherwise detected ammonia until the well was at a depth of approximately 230 ft on March 31. The photoionizer meter pegged on the 20 scale using the 11.7-eV probe, and the driller utilized a respirator and fresh air for the remainder of the day.

Samples were collected every 5 ft. Samples are analyzed for moisture content when appropriate and for chemical analyses every 20 ft from 45 to 145 ft.

Well 299-E17-15

Drilling began on March 24, 1988. The borehole was drilled to approximately 148 ft by March 31. Ammonia was first smelled at a depth of approximately 100 ft on March 28. On March 29 ammonia was measured to be approximately 1000 ppm by WHC respiratory protection personnel and the driller utilized a respirator and fresh air when welding. Respiratory protection personnel monitored the site on March 30 when the well was at a depth of approximately 147 ft. No ammonia was detected.

Samples were collected every 5 ft. Samples are analyzed for moisture content when appropriate and for selected chemical analyses at 70 ft and every 5 ft from 80 ft to 145 ft.

Well 299-E17-16

Drilling commenced on March 10, 1988. The borehole was drilled to approximately 337 ft (total depth) by March 25. Ammonia was detected and measured at 1000 ppm by WHC respiratory protection personnel at a depth of 90 ft on March 14. The driller utilized a respirator and fresh air when welding. No combustibles were detected. The level of ammonia decreased after additional casing was driven and was 30 ppm on March 15. No ammonia was noticed by smell or detected by WHC respiratory protection personnel from 130 ft to the bottom of the drilled hole; however, several small deflections on the photoionizer meter and an unknown odor were noticed at 205 and 255 ft, respectively.

The water table was encountered at a depth of approximately 313 ft. Twenty feet of 30-slot (0.030-in.) stainless steel telescoping screen were set in the well. Borehole geophysical logs (gamma, neutron, and density) were run on March 28.

Samples were collected every 5 ft. Samples are analyzed for moisture content when appropriate and for selected chemical analyses every 5 ft between 45 and 75 ft.

Well 299-E17-17

Drilling began on March 17, 1988. The borehole was drilled to approximately 267 ft by March 31. Ammonia was not noticed by smell or detected at any depth.

Samples were collected every 5 ft. Samples are analyzed for moisture content when appropriate and for selected chemical analyses every 20 ft from 45 ft to 145 ft.

Well 299-E17-18

Drilling began on March 28, 1988. The borehole was drilled to approximately 105 ft by March 31. Ammonia was not noticed by smell or detected at any depth.

Samples were collected every 5 ft. Samples are analyzed for moisture content when appropriate and for selected chemical analyses every 20 ft from 25 to 105 ft.

Hydrogeologic Characterization Effort

The hydrogeologic characterization effort was primarily limited to the collection and field descriptions of geologic samples during drilling. Water levels were measured in existing wells to evaluate the direction of groundwater flow.

In general, coarse to medium, well-sorted sand predominates to approximately 230 ft. Occasional thin silt and/or $CaCO_3$ cemented layers are present in this interval, with one prominent layer of silt approximately 1-ft thick at a depth ranging from 102 to 110 ft. A lithology change to sandy gravels with a silty matrix occurred at approximately 235 ft in well 299-E17-16.

Moisture content determinations were completed for several samples by March 31 and are provided in Table 13.

Ground-water samples were collected from well 299-E17-16 after the screen was set, and the well was developed by bailing. The constituents analyzed for and the results are as follows:

Constituent	Results
Total Alpha	5.6 ± 1.2 pCi/L
Total Beta	221 ± 26 pCi/L
Gamma Scan	
^{60}Co	25.4 ± 8 pCi/L
^{137}Cs	1.1 ± 4.0 pCi/L
^{106}Ru	99.1 ± 42.3 pCi/L
Tritium	154,000 ± 5,720 pCi/L
^{129}I	9.7 ± 8.2 pCi/L
^{90}Sr	4.83 ± 0.78 pCi/L
^{99}Tc	126 ± 9.6 pCi/L
Volatile Organics	None detected
Nitrate (as NO_3)	60,900 ppb
Ammonium	54 ppb
Fluoride	542 ppb

Aquifer tests will be conducted during April and May 1988. Current plans are to discharge the water to the 216-A-45 Crib because of the potential that ground water will exceed WHC standards for discharging aquifer test water directly to the ground.

TABLE 13. Moisture Content (percent) Data for Wells at the 216-A-36B Crib

Depth, ft	Well Number 299-E17-14	299-E17-15	299-E17-16	299-E17-17	299-E17-18
5	9.6	7.1	2.6	4.4	2.9
10		4.9	3.4	4.1	2.5
15	2.8	4.3	4.8	2.0	2.0
20	7.5	2.8	1.9	1.7	1.4
25	2.9	4.0	1.7	1.4	1.3
30	2.9	2.5	1.9	1.4	1.5
35	3.4	4.3	2.2	1.5	1.5
40	9.7	3.9	4.4	1.6	1.5
45	3.3	2.9	2.8	1.4	
50	3.6	3.0	2.7	1.4	
55	3.0	2.9	3.1	1.7	
60	3.4	2.7	3.9	1.5	
65		4.2	4.8	1.8	
70	6.3	3.8	6.0	1.9	
75	6.3	5.0	5.8	1.7	
80	7.2	3.2	4.2	2.4	
85	2.5	6.8	5.7	2.0	
90	3.7	2.7	5.6	1.8	
95	3.1	4.3	5.2	1.6	
100	3.5	4.7	5.5	1.9	
105	4.8	6.3	5.4	1.6	
110	4.4		4.6	1.5	
115	4.7	4.6	3.5	1.8	
120	5.9	5.5	4.9	1.8	
125	5.8	6.3	3.8	1.5	
130	4.9	5.3	5.1	1.8	
135	5.7	6.1	4.2	2.0	
140	12.2	5.6	5.2	1.7	
145	6.1		3.7	1.8	
150	5.9		5.1		
155	6.6		5.2	1.9	
160	5.3		4.9	1.7	
165	5.2		4.6	2.3	
170			4.5	1.6	
175			4.5	1.6	
180			4.5	1.6	
185			4.7		
190			4.8	1.8	
195			4.9	1.8	
200			5.4	1.8	
205			4.2	3.7	
210			5.1	1.9	
215			4.6		
220			4.7		
225			6.1		

TABLE 13. (contd)

Depth, ft	Well Number 299-E17-14	299-E17-15	299-E17-16	299-E17-17	299-E17-18
225			6.1		
230			6.5		
235			4.9		
240					
245			4.1		
250			4.4		
255			4.4		
260			4.2		
265					
270			4.8		
275			4.8		
280					
285			5.0		
285			4.9		
290			4.9		
295			5.5		
300			5.5		
305			5.1		
310					

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Routine sampling and analysis of ground water have not yet been initiated as part of this detection-level ground-water monitoring system. Sampling will commence in May 1988.

1301-N LIQUID WASTE DISPOSAL FACILITY

E. J. Jensen

The preliminary closure/postclosure plan for the 1301-N Liquid Waste Disposal Facility (LWDF) contains the information collected through April 24, 1987. Subsequent information on the progress made and data obtained by this RCRA compliance ground-water monitoring project are contained in this section.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Plans for drilling and hydrogeologic characterization were conducted during this quarter, and one well was installed. The details of these activities are described below.

Well Drilling

The installation of well 199-N-67 was completed during this quarter; the well was drilled as part of a DOE Headquarters environmental survey of the Hanford Site. EG&G Idaho, Inc., developed the well construction specifications for this well, and KEH performed the drilling services.

A cable-tool drill rig was moved on the site and set up at the location of the well to be drilled (199-N-67). The drilling progressed slowly because of the well's location within a radiation zone, and some of the drill cuttings had to be placed in drums. The sediments in the borehole were mostly gravels, which reduced the drilling rate. The contact between the Hanford and Ringold formations was encountered at 43 ft below land surface. This contact is distinct in the 100-N Area because the overlying Hanford formation is olive-gray and the Ringold Formation is dark brown. The borehole was drilled short of the Ringold clay layer, which probably exists at 100 ft below land surface. The water table was encountered at 65 ft below land surface on February 29, 1988. A 20-slot stainless steel screen was installed from 60.5 to 76 ft, with stainless steel casing to the surface. The well was completed at 79 ft below land surface on March 2. The casing elevation and coordinates will be surveyed when the remaining two wells have been completed. The as-built diagram, geologic column, and geologist's and driller's logs for well 199-N-67 are presented in Appendix C.

Figure 15 illustrates a well location map for the 100-N Area.

Hydrogeologic Characterization

Several important characterization studies were conducted during the quarter. These studies include collection of sediment samples during drilling, borehole geophysical logging, and water-level measurements. These activities are described below.

Sediment samples were collected at regular 5-ft intervals during drilling, as stipulated in the draft compliance plan. The grain-size distribution, color, and mineralogic content of the samples were described in the field by the geologist and recorded on drill log forms (see Appendix C). The samples were also tested with hydrochloric acid in the field to obtain an indication of the $CaCO_3$ content.

Three borehole geophysical probes were run in well 199-N-67 after it had been drilled and before well completion was started. The neutron-epithermal-neutron, gamma-gamma (density), and natural gamma logs were used because of their ability to provide meaningful information through the carbon steel casing and in the unsaturated zone. Copies of these logs are included in Appendix C.

The water table in the 100-N Area was defined by a series of water-level measurements. Water-level measurements from the fall of 1985 and the winter of 1986-1987 were summarized in a report by Jensen (1987). Currently, water-level measurements are taken monthly from 38 wells around the 100-N Area. These measurements were begun in January 1988 and will continue on a monthly schedule. The water-table maps for this quarter are shown in Figures 16, 17, and 18.

Initial Water-Quality Analyses

A ground-water sample was taken from well 199-N-67 shortly after it was completed to obtain information about the water quality before aquifer testing was performed. The sample was taken after the well was developed with

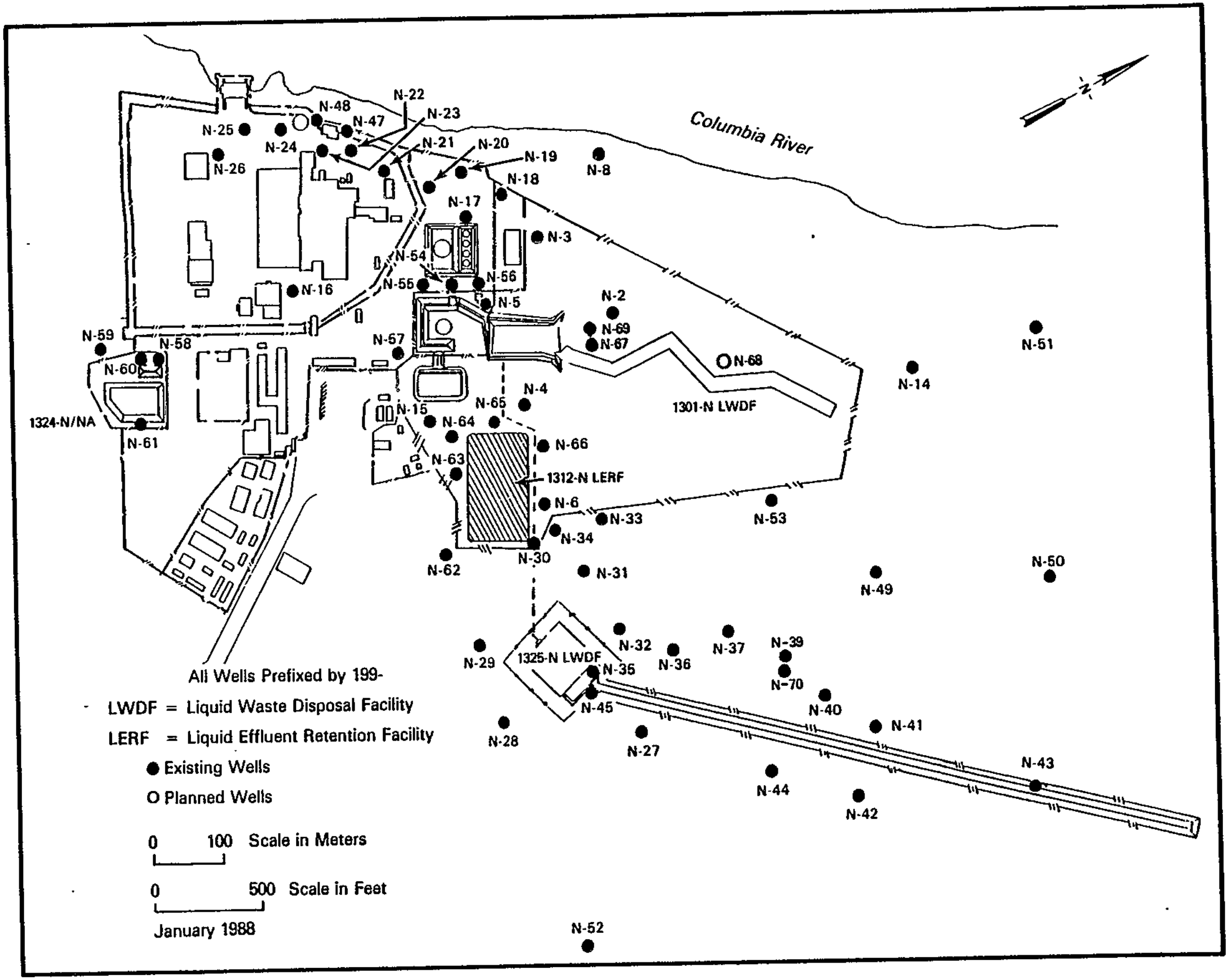

FIGURE 15. Well Location Map for the 100-N Area

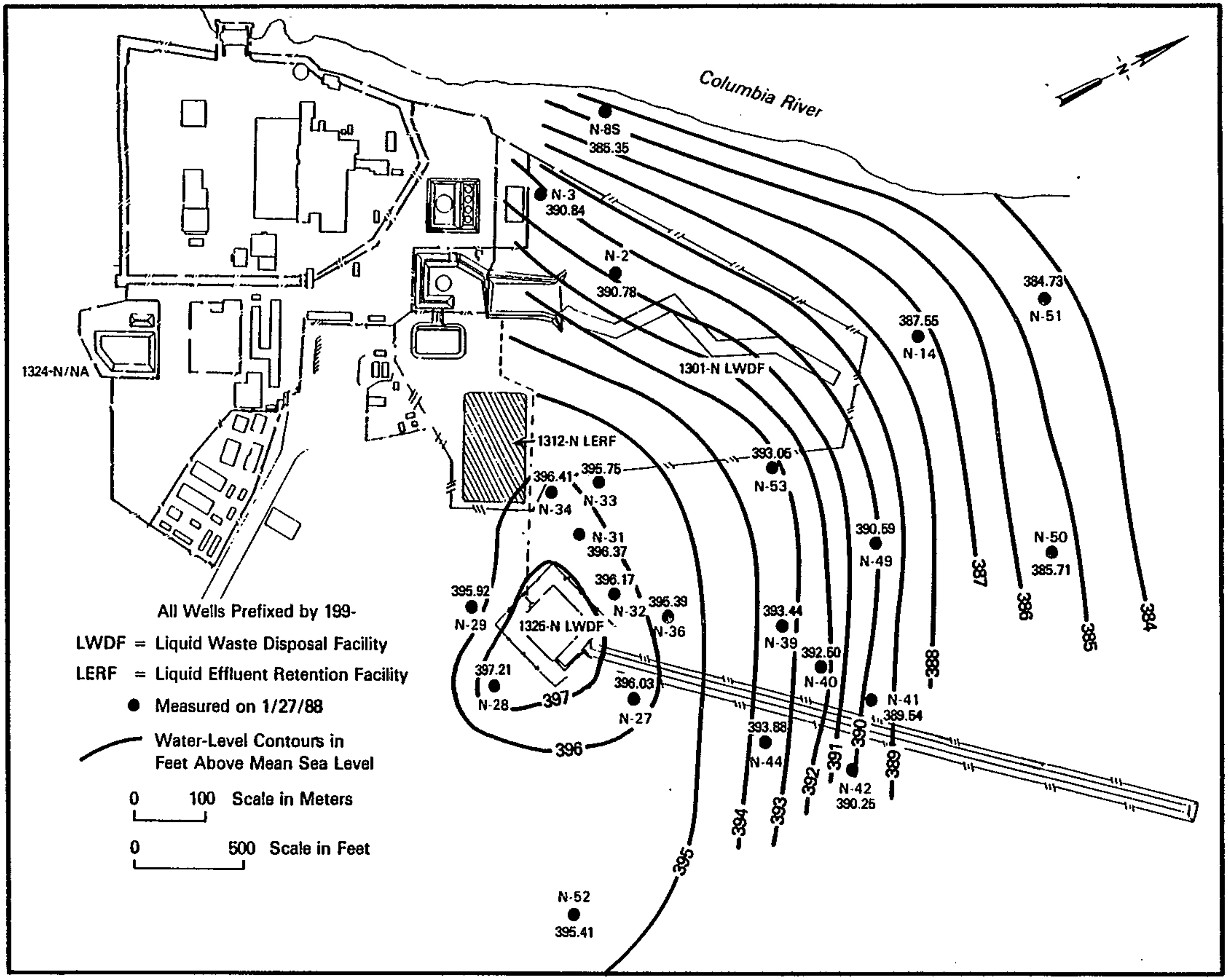

FIGURE 16. Water-Table Map of the 100-N Area, January 1988

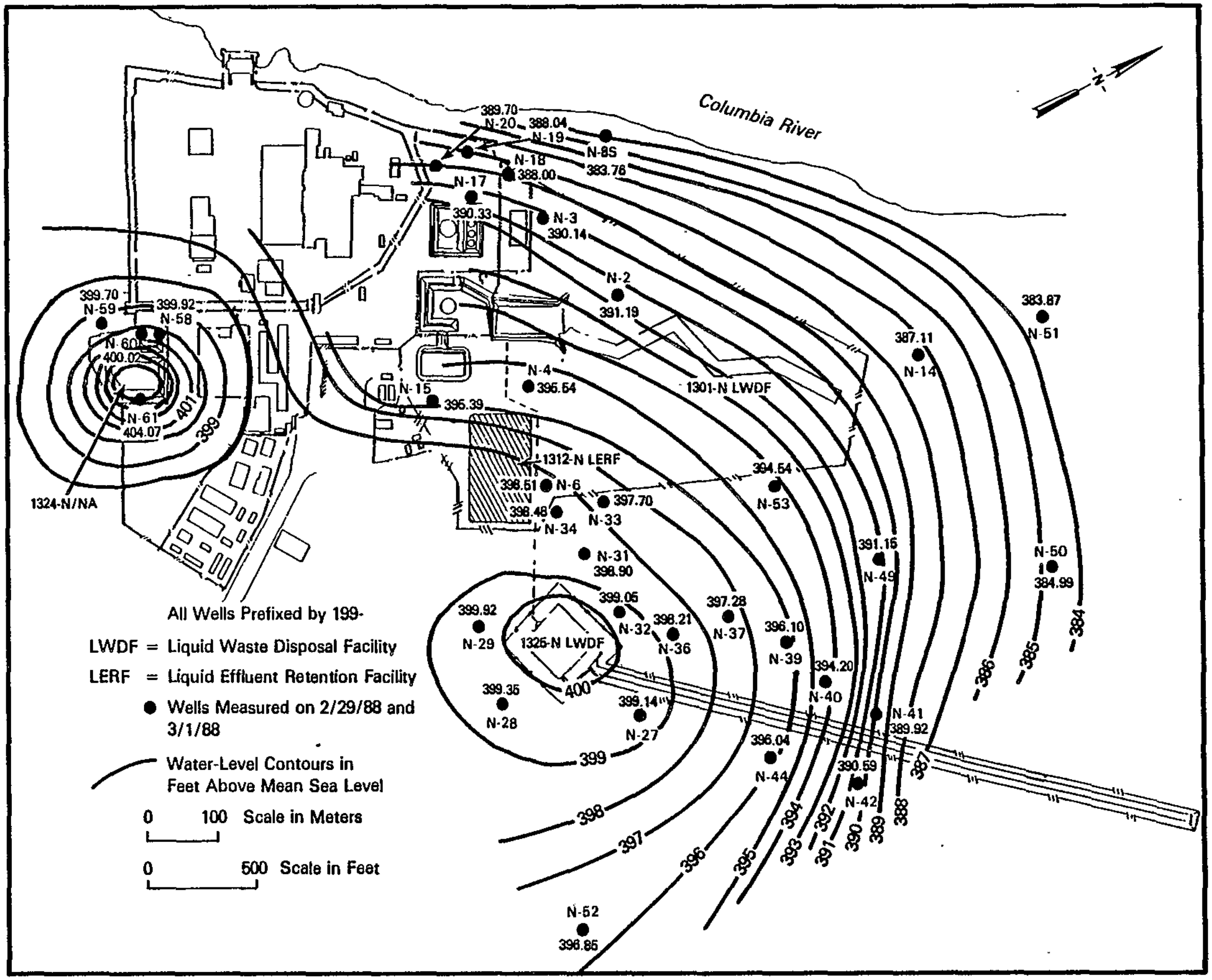

FIGURE 17. Water-Table Map of the 100-Area, February 1988

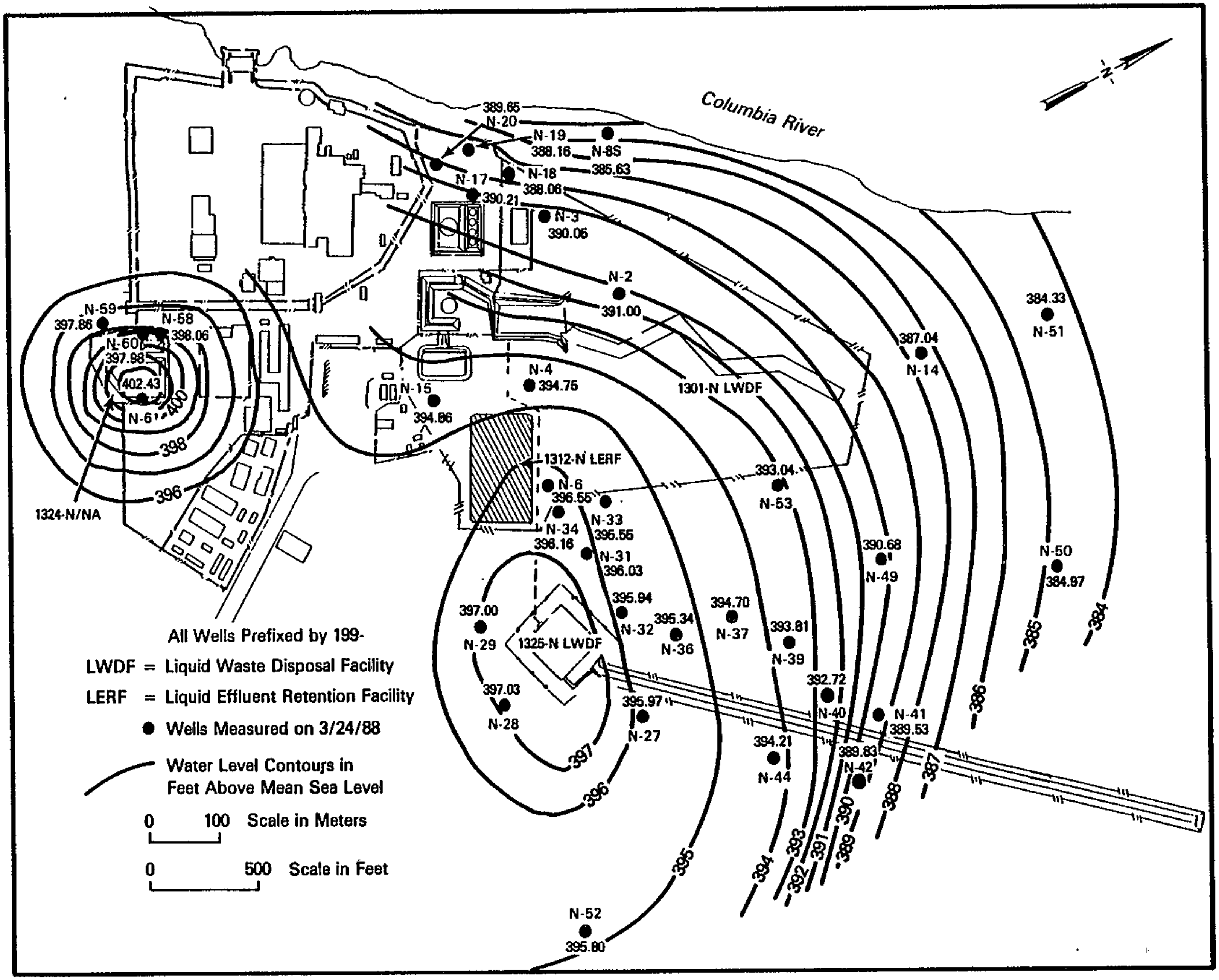

FIGURE 18. Water-Table Map of the 100-N Area, March 1988

the bailer from the drill rig until the water was relatively clear. Then the sample was obtained with a Teflon®(a) bailer and taken to UST for analysis. The sample was analyzed for gross beta, gross alpha, tritium, ^{60}Co, ^{137}Cs, ^{106}Ru, ^{90}Sr, $^{238,239,240}Pu$, and volatile organics. The results of these analyses are shown in Table 14.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Quarterly sampling and analysis of the ground water around the 1301-N LWDF were initiated in December 1987, and the results are discussed in the following subsections.

Collection and Analysis

Sampling and analysis were conducted on the five existing wells surrounding the 1301-N LWDF in December 1987. All of the wells sampled around the LWDF are sampled on a quarterly schedule. Table 15 identifies the wells and sample collection schedule.

Analyses performed on each sample included the primary drinking water standards, water-quality parameters, contamination indicators specified in 40 CFR 265.92(b) (EPA 1984), and specific dangerous waste constituents known to have been discharged to the facility. The radionuclides of tritium, ^{90}Sr, natural uranium, and a gamma scan (^{60}Co, ^{137}Cs, and ^{106}Ru) are being added to the list of analyses for the June 1988 sampling. Phenols, ammonia, and hydrazine will also be added at that time. These radioactive and hazardous constituents, except phenol, may have been discharged to the facility in the past. In addition, selected samples will be analyzed in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is available. Four replicate tests for pH, conductivity, total organic halogens, and total organic carbon were added to the list of analyses in March 1988 to supply the needed information for statistical determinations required by 40 CFR 265 (EPA 1984).

(a) ®Teflon is a registered trademark of the E. I. du Pont deNemours and Company, Inc., Wilmington, Delaware.

TABLE 14. Initial Ground-Water Analyses From Samples Taken During Drilling of Well 199-N-67

Constituent Radionuclides, pCi/L; Volatile Organic Analyses, ppb	Results	Overall Counting Error
Gross Beta	34,600.00	688.00
Gross Alpha	0.6380	0.747(a)
Tritium	109,000.00	8,180.00
^{60}Co	111.00	26.10
^{137}Cs	-2.32	7.19(a)
^{106}Ru	41.10	73.20(a)
^{90}Sr	18,300.00	6,490.00
^{238}Pu	-0.00291	0.00442(a)
$^{239,240}Pu$	-0.00356	0.00455(a)
Chloroform	< 5	
1,1,1,Trichloroethane	< 5	

(a) Denotes less than overall counting error.

TABLE 15. Sample Collection Schedule for the 1301-N Liquid Waste Disposal Facility

Well Number	Oct-Nov-Dec 1987	Jan-Feb-Mar 1988	Apr-May-Jun 1988	Jul-Aug-Sep 1988	Oct-Nov-Dec 1988
199-N-2	X	X	X	X	X
199-N-3	X	X	X	X	X
199-N-4	X	X	X	X	X
199-N-14	X	X	X	X	X
199-N-49	X	X	X	X	X
199-N-67			X	X	X
199-N-68(a)					
199-N-69(b)				X	

(a) To be drilled during 1989.
(b) To be drilled in June 1988.

Discussion of Results

The results of all analyses from December 1987 are summarized in Table 16. Table 17 contains the analytical data for constituents that were found to be above detection limits in at least one analysis. The nitrate concentration of 55,550 ppb in well 199-N-49 exceeded the EPA drinking water standard of 45,000 ppb. Gross beta exceeded the EPA drinking water standard of 50 pCi/L in the five wells sampled during December 1987. Coliform also exceeded the EPA drinking water standard. The additional radionuclides added to the list of analyses for the June 1988 sampling should help identify which specific radionuclides are causing the elevated beta levels.

Quality Assurance/Quality Control

A quality control (QC) plan for RCRA compliance projects was developed and accepted on December 31, 1987. The main focus of the QC plan is to ensure that analytical results reported by the primary analytical laboratory (currently UST) are of acceptable quality. Results of both internal UST and external checks are monitored by the project QC plan and are reported monthly. Data monitored by the QC plan include reports issued by UST, results of EPA and DOE interlaboratory comparisons, analysis of blind standards, and interlaboratory comparisons with duplicate field samples. Established PNL quality assurance procedures will be used in conjunction with the QC plan.

9 2 1 2 - 7 0 0 3 9

TABLE 16. Sample Analysis Summary for Wells Near the 1301-N Liquid Waste Disposal Facility, December 1987

Constituent List=Contamination Indicator Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
191	CONDFLD	UMHO	1	5	0		700	WACS	xxx	Specific conductance, field
199	PHFIELD		0.1	5	0		6.5-8.5	EPAS		pH, field

Constituent List=Drinking Water Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	5	4		1	EPA	xxx	Coliform bacteria
111	BETA	PCI/L	8	5	0		50	EPA	xxx	Gross beta
181	RADIUM	PCI/L	1	5	0		5	EPA		Total radium
212	ALPHA	PCI/L	4	5	0		15	EPA		Gross alpha
A06	BARIUM	PPB	6	5	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	5	5	***	10	EPA		Cadmium
A08	CHROMUM	PPB	10	5	3		50	EPA		Chromium
A10	SILVER	PPB	10	5	5	***	50	EPA		Silver
A20	ARSENIC	PPB	5	5	4		50	EPA		Arsenic
A21	MERCURY	PPB	0.1	5	5	***	2	EPA		Mercury
A22	SELENUM	PPB	5	5	5	***	10	EPA		Selenium
A33	ENDRIN	PPB	0.1	5	5	***	0.2	EPA		Endrin
A34	METHLOR	PPB	3	5	5	***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	5	5	***	5	EPA		Toxaphene
A36	a-BHC	PPB	0.1	5	5	***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	0.1	5	5	***	4	EPA		Beta-BHC
A38	g-BHC	PPB	0.1	5	5	***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	0.1	5	5	***	4	EPA		Delta-BHC
A51	LEADGF	PPB	5	5	3		50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	5	0		45000	EPA	xxx	Nitrate
C74	FLUORID	PPB	500	5	5	***	4000	EPA		Fluoride
H13	2,4-D	PPB	2	5	5	***	100	EPA		2,4-D [Dichlorophenoxyacetic acid]
H14	2,4,5TP	PPB	2	5	5	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	5	0		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	5	4		10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	5	5	***	50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	5	5	***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	5	5	***	50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	0.1	5	5	***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	5	5	***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	5	5	***	50	EPA		Lead, filtered

TABLE 16. (contd)

Constituent List=Water Quality Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A11	SODIUM	PPB	200	5	0		.			Sodium
A17	MANGESE	PPB	5	5	2		50	EPAS	xxx	Manganese
A19	IRON	PPB	30	5	0		300	EPAS	xxx	Iron
C73	SULFATE	PPB	500	5	0		250000	EPAS		Sulfate
C75	CHLORID	PPB	500	5	0		250000	EPAS		Chloride
H24	FSODIUM	PPB	200	5	0		.			Sodium, filtered
H29	FMANGAN	PPB	5	5	4		50	EPAS		Manganese, filtered
H31	FIRON	PPB	30	5	3		300	EPAS		Iron, filtered

Constituent List=Site Specific and Other Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A04	ZINC	PPB	5	5	0		5000	EPAS		Zinc
A05	CALCIUM	PPB	50	5	0		.			Calcium
A12	NICKEL	PPB	10	5	4		.			Nickel
A13	COPPER	PPB	10	5	3		1300	EPAP		Copper
A14	VANADUM	PPB	5	5	3		.			Vanadium
A16	ALUMNUM	PPB	150	5	2		.			Aluminum
A18	POTASUM	PPB	100	5	0		.			Potassium
A50	MAGNES	PPB	50	5	0		.			Magnesium
A61	TETRANE	PPB	5	5	5	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A64	METHONE	PPB	10	5	5	***	.			Methyl ethyl ketone
A67	1,1,1-T	PPB	5	5	5	***	200	EPA		1,1,1-trichloroethane
A68	1,1,2-T	PPB	5	5	5	***	.			1,1,2-trichloroethane
A69	TRICENE	PPB	5	5	5	***	5	EPA		Trichloroethylene [1,1,2-trichloroethene
A70	PERCENE	PPB	5	5	5	***	.			Perchloroethylene
A71	OPXYLE	PPB	5	5	5	***	440	EPAP		Xylene-o,p
A80	CHLFORM	PPB	5	5	0		100	EPA		Chloroform [Trichloromethane]
A93	METHYCH	PPB	10	5	4		.			Methylene chloride
B14	M-XYLE	PPB	5	5	5	***	440	EPAP		Xylene-m
C76	PHOSPHA	PPB	1000	5	5	***	.			Phosphate
H18	FZINC	PPB	5	5	4		5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	5	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	5	5	***	.			Nickel, filtered
H26	FCOPPER	PPB	10	5	5	***	1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	5	2		.			Vanadium, filtered
H28	FALUMIN	PPB	150	5	5	***	.			Aluminum, filtered
H30	FPOTASS	PPB	100	5	0		.			Potassium, filtered
H32	FMAGNES	PPB	50	5	0		.			Magnesium, filtered
H68	HEXONE	PPB	10	5	5	***	.			Hexone

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986)
National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 17. Constituents with at Least One Detected Value Obtained from Wells Near the 1301-N Liquid Waste Disposal Facility, December 1987

Well name	Collection Date	Duplicate sample number	ALPHA PCI/L 15	ALUMNUM PPB .	ARSENIC PPB 50	BARIUM PPB 1000	FBARIUM PPB 1000	BETA PCI/L 50	FCADMIU PPB 10	FCALCIU PPB .	CALCIUM PPB .
1-N-2	16DEC87		*0.348	194	<5	25	26	1,130	2	27,700	28,700
1-N-3	16DEC87		1.970	357	<5	85	84	4,380	<2	72,800	75,800
1-N-4	16DEC87		1.600	828	<5	33	27	181	<2	30,500	32,000
1-N-14	16DEC87		*-0.150	<150	<5	17	20	2,370	<2	28,800	31,200
1-N-49	14DEC87		0.949	<150	5	22	21	134	<2	32,100	32,800

Well name	Collection Date	Duplicate sample number	CHLFORM PPB 100	CHLORID PPB 250000*	CHROMUM PPB 50	COLIFRM MPN 1	CONDFLD UMHO 700*	COPPER PPB 1300*	IRON PPB 300*	FIRON PPB 300*	LEADGF PPB 50
1-N-2	16DEC87		#3	1,200	<10	<2.2	202	<10	366	<30	13
1-N-3	16DEC87		#4	5,990	11	16.0	480	22	2000	64	<5
1-N-4	16DEC87		#2	1,250	21	<2.2	216	<10	3080	<30	<5
1-N-14	16DEC87		#3	966	<10	<2.2	208	<10	100	<30	<5
1-N-49	14DEC87		#2	848	<10	<2.2	1721	116	127	31	23

Well name	Collection Date	Duplicate sample number	MAGNES PPB .	FMAGNES PPB .	FMANGAN PPB 50*	MANGESE PPB 50*	METHYCH PPB . .	NICKEL PPB .	NITRATE PPB 45000	PHFIELD .	FPOTASS PPB .
1-N-2	16DEC87		4,780	5,020	<5	11	<10	<10	34,000	7.4	1,820
1-N-3	16DEC87		11,900	12,500	21	111	<10	<10	26,600	6.5	3,090
1-N-4	16DEC87		5,440	5,510	<5	73	<10	33	33,600	7.2	3,080
1-N-14	16DEC87		4,870	5,010	<5	<5	<10	<10	39,300	7.6	1,860
1-N-49	14DEC87		6,320	6,300	<5	<5	#3	<10	55,500	7.4	2,660

Well name	Collection Date	Duplicate sample number	POTASUM PPB .	RADIUM PCI/L 5	SODIUM PPB .	FSODIUM PPB .	SULFATE PPB 250000*	FVANADI PPB .	VANADUM PPB .	ZINC PPB 5000*	FZINC PPB 5000*
1-N-2	16DEC87		1,550	*0.0266	2,540	3,170	11,600	<5	<5	9	<5
1-N-3	16DEC87		2,540	0.3720	8,630	10,900	136,000	<5	<5	8	<5
1-N-4	16DEC87		2,680	*0.1340	3,700	4,420	13,200	8	9	62	<5
1-N-14	16DEC87		1,620	*-0.0492	3,340	3,910	10,300	7	<5	9	<5
1-N-49	14DEC87		2,820	*0.0322	4,300	3,990	10,100	15	12	76	12

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable
* - Less than 2-sigma counting error for radionuclides

1325-N LIQUID WASTE DISPOSAL FACILITY

E. J. Jensen

The preliminary closure/postclosure plan for the 1325-N LWDF (shown in Figure 15) contains the information collected through June 30, 1987. Subsequent information on the progress made and data obtained by this RCRA compliance ground-water monitoring project are contained herein.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling and hydrogeologic characterization were conducted during this quarter. The details of these activities are described below.

Well Drilling

No new wells were drilled during this quarter.

Well 199-N-70 will be drilled in April 1988 and will be completed at the base of the sands and gravels that overlie the Ringold Formation clay layer adjacent to well 199-N-39. Well 199-N-39 is completed in the top of the uppermost unconfined aquifer. The well location map in Figure 15 illustrates the proximity of these wells to the 1325-N LWDF.

With the review of PNL, WHC developed the well construction specifications for this well. The drilling services will be performed by KEH with a cable-tool drill rig.

Hydrogeologic Characterization

The water table in the 100-N Area was defined by a series of water-level measurements. Water-level measurements from the fall of 1985 and the winter of 1986-1987 were summarized in a report by Jensen (1987). Currently, water-level measurements are taken monthly from 38 wells around the 100-N Area. These monthly measurements were begun in January 1988 and will continue on a monthly schedule. The water-table maps for this quarter were shown in Figures 16, 17, and 18.

From February 23 to 26, 1988, a test was run on the reactor coolant system and waste disposal facility to determine if a leaky pipe were repaired. As a result, 9,878,400 gal of water were discharged to the 1325-N LWDF in

3.5 days (1960 gal/min). This water begins its route to the 1325-N LWDF by being pumped out of the river for deionization before it enters the reactor cooling tubes. From the reactor cooling tubes, the water enters the end storage basin where it overflows to the lift station and then into the 36-in. main line. The 36-in. main line takes the water to the 1325-N crib and if a sufficient quantity of water is discharged to the crib, it overflows the first weir into the trench. During this discharge period, the water flowed over the first weir into the trench at approximately 200 gal/min for 1 to 2 days. This is the second time that water has been discharged to the trench (Jensen 1987) and is probably the largest volume of water to enter the 1325-N LWDF.

The water that was discharged to the 1325-N LWDF caused a significant rise in water level in well 199-N-27 within hours of the discharge (Figure 19). This well has a Terra 8D®[a] data logger and transducer installed in it, which takes measurements every 15 min. The hydrograph shown in Figure 19 compares the water level in well 199-N-27 to that of the river and the two other wells close to the river.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Quarterly sampling and analysis of the ground water around the 1325-N LWDF were initiated in December 1987, and the results are discussed in the following subsections.

Collection and Analysis

Sampling and analysis were conducted on 10 wells surrounding the 1325-N LWDF during this quarter. One well was sampled in November 1987; nine wells were sampled in December 1987. Table 18 identifies the wells and sample collection schedule.

Analyses performed on each sample include those for primary drinking water standards, water-quality parameters, contamination indicators specified in 40 CFR 265.92 (EPA 1984), and specific dangerous waste constituents known

(a) Terra 8D® is a registered trade name of Terrascience Systems, Ltd., Vancouver, British Columbia.

to have been discharged to the facility. The radionuclides of tritium, ^{90}Sr, natural uranium, and a gamma scan (^{60}Co, ^{137}Cs, and ^{106}Ru) are being added to the list of analyses for the June 1988 sampling. Phenols, ammonia, and hydrazine will also be added at that time. These radioactive and hazardous constituents, except phenol, may have been discharged to the facility in the past. In addition, selected samples will be analyzed in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is available. Four replicate tests for pH, conductivity, total organic halogens, and total organic carbon were added to the list of analyses in March 1988 to supply the needed information for statistical determinations required by 40 CFR 265 (EPA 1984).

Discussion of Results

All analyses from December 1987 are summarized in Table 19. Table 20 contains the analytical data for constituents that were found to be above

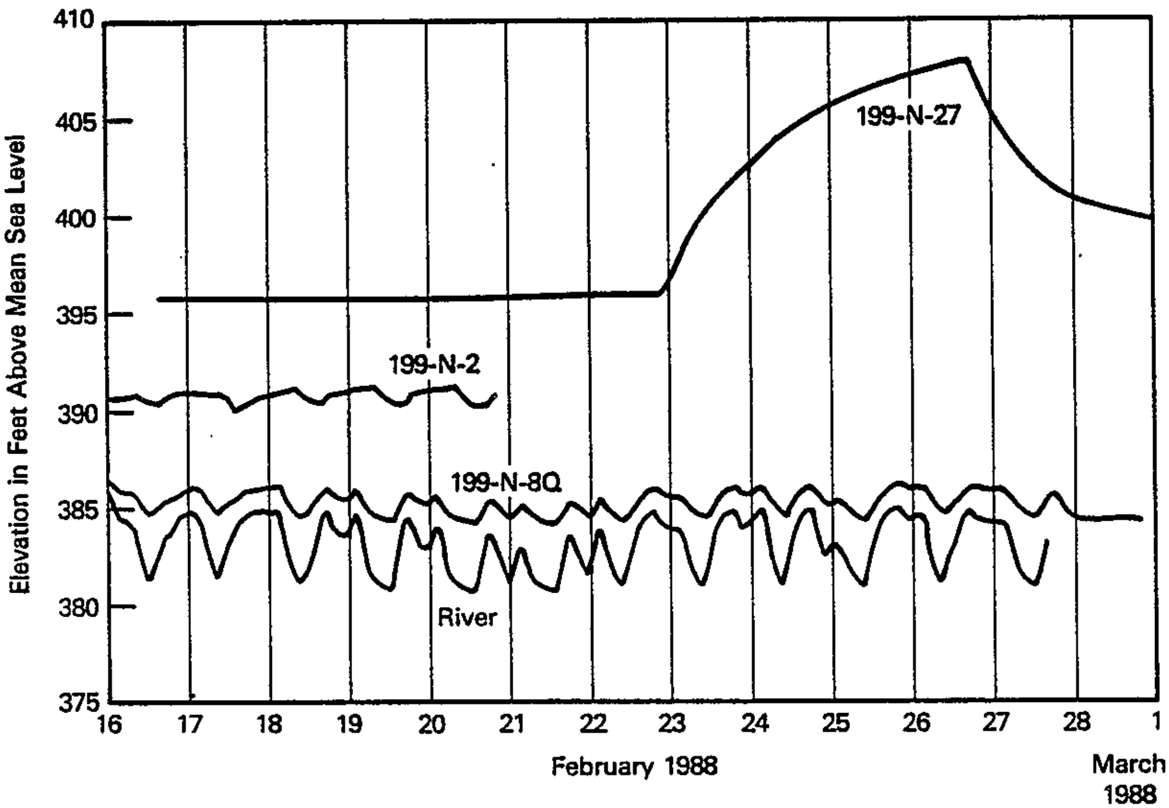

FIGURE 19. Hydrograph for Well 199-N-27

TABLE 18. Sample Collection Schedule for the 1325-N Liquid Waste Disposal Facility

Well Number	Oct-Nov-Dec 1987	Jan-Feb-Mar 1988	Apr-May-Jun 1988	Jul-Aug-Sep 1988	Oct-Nov-Dec 1988
199-N-27	X	X	X	X	X
199-N-29	X	X	X	X	X
199-N-31	X	X	X	X	X
199-N-32	X	X	X	X	X
199-N-33		X	X	X	X
199-N-36		X	X	X	X
199-N-39	X	X	X	X	X
199-N-41	X	X	X	X	X
199-N-42	X	X	X	X	X
199-N-52	X	X	X	X	X
199-N-70(a)				X	X
699-81-58	X	X	X	X	X

(a) To be drilled in 1988.

detection limits in at least one analysis. The nitrate concentrations of 50,800 and 54,700 ppb in wells 199-N-32 and 199-N-49, respectively, exceeded the EPA drinking water standard of 45,000 ppb. Gross beta exceeded the EPA drinking water standard of 50 pCi/L in the 10 wells sampled during December 1987, except for well 699-81-58 that had 0 pCi/L of beta. Coliform also exceeded the EPA drinking water standard in well 199-N-39. The additional radionuclides added to the list of analyses for the June 1988 sampling should aid the identification of which specific radionuclides are causing the elevated beta levels.

Quality Assurance/Quality Control

A QC plan for RCRA compliance projects was developed and accepted on December 31, 1987. The main focus of the QC plan is to ensure that

TABLE 19. Sample Analysis Summary for the 1325-N Liquid Waste Disposal Facility, December 1987

------------------------------------- Constituent List=Contamination Indicator Parameters -------------------------------------

Constituent Code	Constituent Name	Constituent Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Drinking Water Limits Agency	Drinking Water Limits Exceeded	Full name
191	CONDFLD	UMHO	1	6	0		700	WACS	xxx	Specific conductance, field
199	PHFIELD		0.1	6	0		6.5-8.5	EPAS		pH, field
207	PH-LAB		0.01	2	0		6.5-8.5	EPAS		pH, laboratory
C69	TOC	PPB	1000	2	0		.			Total organic carbon
H42	TOXLDL	PPB	20	2	0		.			Total organic halogens, low DL

------------------------------------- Constituent List=Drinking Water Parameters -------------------------------------

Constituent Code	Constituent Name	Constituent Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Drinking Water Limits Agency	Drinking Water Limits Exceeded	Full name
109	COLIFRM	MPN	2.2	8	7		1	EPA	xxx	Coliform bacteria
111	BETA	PCI/L	8	10	0		50	EPA	xxx	Gross beta
181	RADIUM	PCI/L	1	8	0		5	EPA		Total radium
212	ALPHA	PCI/L	4	10	0		15	EPA		Gross alpha
A06	BARIUM	PPB	6	8	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	8	8	***	10	EPA		Cadmium
A08	CHROMUM	PPB	10	8	8	***	50	EPA		Chromium
A10	SILVER	PPB	10	8	8	***	50	EPA		Silver
A20	ARSENIC	PPB	5	8	3		50	EPA		Arsenic
A21	MERCURY	PPB	0.1	8	8	***	2	EPA		Mercury
A22	SELENUM	PPB	5	8	8	***	10	EPA		Selenium
A33	ENDRIN	PPB	0.1	8	8	***	0.2	EPA		Endrin
A34	METHLOR	PPB	3	8	8	***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	8	8	***	5	EPA		Toxaphene
A36	a-BHC	PPB	0.1	8	8	***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	0.1	8	8	***	4	EPA		Beta-BHC
A38	g-BHC	PPB	0.1	8	8	***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	0.1	8	8	***	4	EPA		Delta-BHC
A51	LEADGF	PPB	5	8	8	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	10	0		45000	EPA	xxx	Nitrate
C74	FLUORID	PPB	500	10	10	***	4000	EPA		Fluoride
H13	2,4-D	PPB	2	8	8	***	100	EPA		2,4-D [Dichlorophenoxyacetic acid]
H14	2,4,5TP	PPB	2	8	8	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	10	0		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	10	10	***	10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	10	9		50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	10	10	***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	10	5		50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	0.1	10	10	***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	10	10	***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	10	10	***	50	EPA		Lead, filtered
H63	LFLUORD	PPB	20	2	0		4000	EPA		Fluoride, low DL

TABLE 19. (contd)

Constituent List=Water Quality Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A11	SODIUM	PPB	200	8	0		.			Sodium
A17	MANGESE	PPB	5	8	6		50	EPAS		Manganese
A19	IRON	PPB	30	8	1		300	EPAS	xxx	Iron
C57	PHENOL	PPB	10	2	2	***	.			Phenol
C73	SULFATE	PPB	500	10	0		250000	EPAS		Sulfate
C75	CHLORID	PPB	500	10	2		250000	EPAS		Chloride
H24	FSODIUM	PPB	200	10	0		.			Sodium, filtered
H29	FMANGAN	PPB	5	10	10	***	50	EPAS		Manganese, filtered
H31	FIRON	PPB	30	10	9		300	EPAS		Iron, filtered

Constituent List=Site Specific and Other Parameters

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A04	ZINC	PPB	5	8	3		5000	EPAS		Zinc
A05	CALCIUM	PPB	50	8	0		.			Calcium
A12	NICKEL	PPB	10	8	8	***	.			Nickel
A13	COPPER	PPB	10	8	7		1300	EPAP		Copper
A14	VANADUM	PPB	5	8	0		.			Vanadium
A16	ALUMNUM	PPB	150	8	7		.			Aluminum
A18	POTASUM	PPB	100	8	0		.			Potassium
A50	MAGNES	PPB	50	8	0		.			Magnesium
A61	TETRANE	PPB	5	10	10	***	5	EPA		Tetrachloromethane [Carbon Tetrachloride
A62	BENZENE	PPB	5	2	2	***	5	EPA		Benzene
A63	DIOXANE	PPB	500	2	2	***	.			Dioxane
A64	METHONE	PPB	10	10	10	***	.			Methyl ethyl ketone
A65	PYRIDIN	PPB	500	2	2	***	.			Pyridine
A66	TOLUENE	PPB	5	2	2	***	2000	EPAP		Toluene
A67	1,1,1-T	PPB	5	10	9		200	EPA		1,1,1-trichloroethane
A68	1,1,2-T	PPB	5	10	10	***	.			1,1,2-trichloroethane
A69	TRICENE	PPB	5	10	10	***	5	EPA		Trichloroethylene [1,1,2-trichloroethene
A70	PERCENE	PPB	5	10	10	***	.			Perchloroethylene
A71	OPXYLE	PPB	5	10	10	***	440	EPAP		Xylene-o,p
A72	ACROLIN	PPB	10	2	2	***	.			Acrolein
A73	ACRYILE	PPB	10	2	2	***	.			Acrylonitrile
A74	BISTHER	PPB	10	2	2	***	.			Bis(chloromethyl) ether
A75	BROMONE	PPB	10	2	2	***	.			Bromoacetone
A76	METHBRO	PPB	10	2	2	***	.			Methyl bromide
A77	CARBIDE	PPB	10	2	2	***	.			Carbon disulfide
A78	CHLBENZ	PPB	10	2	2	***	60	EPAP		Chlorobenzene
A79	CHLTHER	PPB	10	2	2	***	.			2-chloroethyl vinyl ether
A80	CHLFORM	PPB	5	10	2		100	EPA		Chloroform [Trichloromethane]
A81	METHCHL	PPB	10	2	2	***	.			Methyl chloride [Chloromethane]
A82	CHMTHER	PPB	10	2	2	***	.			Chloromethyl methyl ether
A83	CROTONA	PPB	10	2	2	***	.			Crotonaldehyde
A84	DIBRCHL	PPB	10	2	2	***	0	EPAP		1,2-dibromo-3-chloropropane
A85	DIBRETH	PPB	10	2	2	***	.			1,2-dibromoethane
A86	DIBRMET	PPB	10	2	2	***	.			Dibromomethane
A87	DIBUTEN	PPB	10	2	2	***	.			1,4-dichloro-2-butene
A88	DICDIFM	PPB	10	2	2	***	.			Dichlorodifluoromethane

TABLE 19. (contd)

-------------------- Constituent List=Site Specific and Other Parameters --------------------

Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
A89	1,1-DIC	PPB	10	2	2	***	.			1,1-dichloroethane
A90	1,2-DIC	PPB	10	2	2	***	5	EPA		1,2-dichloroethane
A91	TRANDCE	PPB	10	2	2	***	70	EPAP		Trans-1,2-dichloroethene
A92	DICETHY	PPB	10	2	2	***	7	EPA		1,1-dichloroethylene
A93	METHYCH	PPB	10	10	4		.			Methylene chloride
A94	DICPANE	PPB	10	2	2	***	6	EPAP		1,2-dichloropropane
A95	DICPENE	PPB	10	2	2	***	.			1,3-dichloropropene
A96	NNDIEHY	PPB	10	2	2	***	.			N,N-diethylhydrazine
A99	HYDRSUL	PPB	10	2	2	***	.			Hydrogen sulfide
B01	IODOMET	PPB	10	2	2	***	.			Iodomethane
B02	METHACR	PPB	10	2	2	***	.			Methacrylonitrile
B03	METHTHI	PPB	10	2	2	***	.			Methanethiol
B04	PENTACH	PPB	10	2	2	***	.			Pentachloroethane
B05	1112-tc	PPB	10	2	2	***	.			1,1,1,2-tetrachlorethane
B06	1122-tc	PPB	10	2	2	***	.			1,1,2,2-tetrachlorethane
B08	BROMORM	PPB	10	2	2	***	100	EPA		Bromoform [Tribromomethane]
B09	TRCMEOL	PPB	10	2	2	***	.			Trichloromethanethiol
B10	TRCMFLM	PPB	10	2	2	***	.			Trichloromonofluoromethane
B11	TRCPANE	PPB	10	2	2	***	.			Trichloropropane
B12	123-trp	PPB	10	2	2	***	.			1,2,3-trichloropropane
B08	BROMORM	PPB	10	2	2	***	100	EPA		Bromoform [Tribromomethane]
B13	VINYIDE	PPB	10	2	2	***	2	EPA		Vinyl chloride
B14	M-XYLE	PPB	5	10	10	***	440	EPAP		Xylene-m
B15	DIETHY	PPB	10	2	2	***	.			Diethylarsine
B19	ACETILE	PPB	3000	2	2	***	.			Acetonitrile
B61	12-dben	PPB	10	2	2	***	.			1,2-dichlorobenzene
B62	13-dben	PPB	10	2	2	***	.			1,3-dichlorobenzene
B63	14-dben	PPB	10	2	2	***	.			1,4-dichlorobenzene
B89	HEXCBEN	PPB	10	2	2	***	.			Hexachlorobenzene
C04	METACRY	PPB	10	2	2	***	.			Methyl methacrylate
C26	PENTCHB	PPB	10	2	2	***	.			Pentachlorobenzene
C37	TETRCHB	PPB	10	2	2	***	.			1,2,4,5-tetrachlorobenzene
C43	TRICHLB	PPB	10	2	2	***	.			1,2,4-trichlorobenzene
C54	HEXACHL	PPB	10	2	2	***	.			Hexachlorophene
C55	NAPHTHA	PPB	10	2	2	***	.			Naphthalene
C56	123TRI	PPB	10	2	2	***	.			1,2,3-trichlorobenzene
C58	135TRI	PPB	10	2	2	***	.			1,3,5-trichlorobenzene
C59	1234TE	PPB	10	2	2	***	.			1,2,3,4-tetrachlorobenzene
C60	1235TE	PPB	10	2	2	***	.			1,2,3,5-tetrachlorobenzene
C70	CYANIDE	PPB	10	2	2	***	.			Cyanide
C71	FORMALN	PPB	500	2	2	***	.			Formalin
C76	PHOSPHA	PPB	1000	10	10	***	.			Phosphate
C79	KEROSEN	PPB	10000	2	2	***	.			Kerosene
C80	AMMONIU	PPB	50	2	1		.			Ammonium ion
H05	ETHOXID	PPB	3000	2	2	***	.			Ethylene oxide
H06	ETHMETH	PPB	10	2	2	***	.			Ethyl methacrylate

TABLE 19. (contd)

--- Constituent List=Site Specific and Other Parameters --------------------------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
H16	TC	PPB	1000	2	0		.			Total carbon
H18	FZINC	PPB	5	10	8		5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	10	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	10	10	***	.			Nickel, filtered
H26	FCOPPER	PPB	10	10	10	***	1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	10	1		.			Vanadium, filtered
H28	FALUMIN	PPB	150	10	10	***	.			Aluminum, filtered
H30	FPOTASS	PPB	100	10	0		.			Potassium, filtered
H32	FMAGNES	PPB	50	10	0		.			Magnesium, filtered
H33	FBERYLL	PPB	5	2	2	***	.			Beryllium, filtered
H35	FSTRONT	PPB	20	2	0		.			Strontium, filtered
H36	FANTIMO	PPB	100	2	2	***	.			Antimony, filtered
H58	ALKALIN	PPB	20000	2	0		.			Total alkalinity, as CaCO3
H68	HEXONE	PPB	10	10	10	***	.			Hexone
I21	TRIBUPH	PPB	10	2	2	***	.			Tributylphosphoric acid

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986)
National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 20. Constituents with at Least One Detected Value Obtained from Wells Near the 1325-N Liquid Waste Disposal Facility, December 1987

Well name	Collection Date	Duplicate sample number	1,1,1-T PPB 200	ALKALIN PPB .	ALPHA PCI/L 15	ALUMNUM PPB .	AMMONIU PPB .	ARSENIC PPB 50	FARSENI PPB 50	BARIUM PPB 1000	FBARIUM PPB 1000
1-N-27	14DEC87		<5	.	*0.529	<150	.	5	6	16	16
1-N-29	22NOV87		<5	45,200	*0.375	.	1,190	.	<5	.	14
1-N-31	11DEC87		<5	.	*0.033	<150	.	<5	<5	17	13
1-N-32	11DEC87		<5	.	*0.749	<150	.	5	5	22	21
1-N-36	11DEC87		#2	.	*0.348	<150	.	<5	<5	15	19
1-N-39	11DEC87		<5	.	*0.083	<150	.	<5	<5	26	21
1-N-41	11DEC87		<5	.	*0.041	<150	.	6	6	20	18
1-N-42	14DEC87		<5	.	*0.181	276	.	8	7	23	16
1-N-52	14DEC87		<5	.	*0.308	<150	.	7	7	23	28
6-81-58	13DEC87		<5	93,200	1.310	.	<50	.	<5	.	17

Well name	Collection Date	Duplicate sample number	BETA PCI/L 50	FCALCIU PPB .	CALCIUM PPB .	CHLFORM PPB 100	CHLORID PPB 250000*	FCHROMI PPB 50	COLIFRM MPN 1	CONDFLD UMHO 700*	COPPER PPB 1300*
1-N-27	14DEC87		486.00	20,800	22,400	#2	663	<10	<2.2	1,380	<10
1-N-29	22NOV87		1140.00	16,400	.	#2	504	<10	.	126	.
1-N-31	11DEC87		248.00	22,300	22,900	#2	<500	<10	<2.2	.	<10
1-N-32	11DEC87		286.00	28,900	29,700	<5	647	<10	<2.2	205	<10
1-N-36	11DEC87		434.00	23,700	24,900	#2	<500	<10	<2.2	1,613	<10
1-N-39	11DEC87		1770.00	31,800	33,400	#2	908	<10	16.0	.	<10
1-N-41	11DEC87		126.00	24,000	23,500	#2	855	<10	<2.2	.	<10
1-N-42	14DEC87		127.00	23,400	25,700	#2	1,090	<10	<2.2	1,519	38
1-N-52	14DEC87		113.00	23,100	25,700	#3	1,410	<10	<2.2	1,460	<10
6-81-58	13DEC87		*0.85	30,400	.	<5	1,270	17	.	.	.

Well name	Collection Date	Duplicate sample number	IRON PPB 300*	FIRON PPB 300*	LFLUORD PPB 4000	MAGNES PPB .	FMAGNES PPB .	MANGESE PPB 50*	METHYCH PPB .	NITRATE PPB 45000	PH-LAB .
1-N-27	14DEC87		<30	<30	.	4,180	3,940	<5	#3	23,700	.
1-N-29	22NOV87		.	<30	104	.	2,980	.	#4	18,100	8.12
1-N-31	11DEC87		146	30	.	3,780	3,650	<5	<10	26,800	.
1-N-32	11DEC87		30	<30	.	5,870	5,720	<5	<10	50,800	.
1-N-36	11DEC87		63	<30	.	4,490	4,350	<5	#2	28,800	.
1-N-39	11DEC87		213	<30	.	6,120	5,820	<5	<10	54,700	.
1-N-41	11DEC87		125	<30	.	5,210	5,200	5	#5	34,100	.
1-N-42	14DEC87		1,900	<30	.	6,020	5,420	16	#4	30,200	.
1-N-52	14DEC87		44	<30	.	6,810	6,940	<5	#2	26,100	.
6-81-58	13DEC87		.	<30	180	.	8,030	.	<10	2,100	8.05

TABLE 20. (contd)

Well name	Collection Date	Duplicate sample number	PHFIELD .	FPOTASS PPB .	POTASUM PPB .	RADIUM PCI/L 5	SODIUM PPB .	FSODIUM PPB .	FSTRONT PPB .	SULFATE PPB 250000*	TC PPB .
1-N-27	14DEC87		8.1	2,920	3,290	*-0.0209	3,310	2,500	.	6,960	.
1-N-29	22NOV87		7.6	3,030	.	.	.	2,120	83	3,630	10,000
1-N-31	11DEC87		.	2,410	2,680	*0.0139	2,400	2,100	.	4,630	.
1-N-32	11DEC87		7.4	2,920	3,090	*-0.0315	2,950	3,150	.	7,030	.
1-N-36	11DEC87		7.5	1,980	2,170	*-0.0685	2,270	2,100	.	5,190	.
1-N-39	11DEC87		.	2,720	3,000	*0.0449	3,850	3,500	.	9,220	.
1-N-41	11DEC87		.	2,640	2,920	*-0.0051	5,330	4,760	.	10,200	.
1-N-42	14DEC87		7.5	2,700	3,150	0.1780	6,440	5,530	.	10,900	.
1-N-52	14DEC87		7.1	3,880	3,370	*0.0419	5,890	7,170	.	13,500	.
6-81-58	13DEC87		.	2,360	.	.	.	4,460	179	15,300	22,000

Well name	Collection Date	Duplicate sample number	TOC PPB .	TOXLDL PPB .	FVANADI PPB .	VANADUM PPB .	ZINC PPB 5000*	FZINC PPB 5000*
1-N-27	14DEC87		.	.	15	12	<5	<5
1-N-29	22NOV87		#391	#2.3	13	.	.	<5
1-N-31	11DEC87		.	.	12	8	<5	<5
1-N-32	11DEC87		.	.	15	14	<5	<5
1-N-36	11DEC87		.	.	13	11	6	5
1-N-39	11DEC87		.	.	14	10	14	<5
1-N-41	11DEC87		.	.	22	16	13	8
1-N-42	14DEC87		.	.	24	29	51	<5
1-N-52	14DEC87		.	.	28	27	10	<5
6-81-58	13DEC87		#251	#1.8	<5	.	.	<5

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable
* - Less than 2-sigma counting error for radionuclides

analytical results reported by the primary analytical laboratory (currently UST) are of acceptable quality. Results of both internal UST and external checks are monitored by the project QC plan, and are reported monthly. Data monitored by the QC plan include reports issued by UST, results of EPA and DOE interlaboratory comparisons, analysis of blind standards, and inter-laboratory comparisons with duplicate field samples. Established PNL quality assurance procedures will be used in conjunction with the QC plan.

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1324-N/NA SURFACE IMPOUNDMENT AND PERCOLATION PONDS

E. J. Jensen

The preliminary closure plan for the 1324-N/NA Percolation Ponds (see Figure 15) contains the information collected through April 24, 1987. Subsequent information on the progress made and data obtained by this RCRA compliance ground-water monitoring project are contained herein.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

The characterization activities conducted during this quarter included well drilling, collection of sediment samples during drilling, borehole geophysical logging, and aquifer testing. These activities are described below.

Well Drilling

The well location map in Figure 15 illustrates the four wells (199-N-58, 199-N-59, 199-N-60, and 199-N-61) drilled around the 1324-N/NA ponds. These wells were completed by November 19, 1987. The well construction specifications were developed by PNL, and KEH performed the drilling services.

Two cable-tool drill rigs were moved on the site for drilling the four wells. The initial holes for the 12-in.-dia starter casing were dug with a backhoe. After the initial casings were set, the cable-tool rigs started drilling with the 8-in. dia temporary casing in place. The sediments in the borehole were mostly gravels, which reduced the drilling rate. The contact between the Hanford and Ringold Formations was encountered at 63 ft below land surface in wells 199-N-59 and 199-N-60. The same contact was encountered at 59 ft below land surface in wells 199-N-58 and 199-N-61. This contact is distinct in the 100-N Area because the overlying Hanford Formation is olive-gray and the Ringold Formation is dark brown. The Hanford Formation consists mainly of sand and gravel. The portions of the Ringold Formation encountered by the boreholes were also sand and gravel. The boreholes were drilled short of the Ringold Formation clay layer, which probably exists between 100 and 130 ft below land surface. All four wells were completed near 70 ft below land surface. The water table was encountered at 60 ft below land surface in wells 199-N-58, 199-N-59, and 199-N-60. The ground water in well 199-N-61 was at 55 ft below land surface. Fifteen feet of 20-slot stainless steel screen were installed with stainless steel pipe in each well. Surveying of the casing elevation and coordinates was performed shortly after the wells were completed. The as-built diagram, geologic column, and geologist's and driller's logs for wells 199-N-58, 199-N-59, 199-N-60, and 199-N-61 are presented in Appendix C.

Hydrogeologic Characterization

Hydrogeologic characterization activities conducted during the quarter include collection of sediment samples during drilling, borehole geophysical logging, and water-level measurements, and aquifer testing and are described below.

Sediment samples were collected at regular 5-ft intervals during drilling, as stipulated in the draft compliance plan. The grain-size distribution, color, and mineralogic content of the samples were studied in the field by the geologist and recorded on drill log forms (see Appendix C). The samples were also tested with hydrochloric acid in the field to obtain qualitative data on the $CaCO_3$ content.

Three borehole geophysical probes were run in well 199-N-60 after it had been drilled and before well completion was started. The resulting neutron-epithermal-neutron, gamma-gamma (density), and natural gamma logs were used because of their ability to provide meaningful information through the carbon steel casing and in the unsaturated zone. Copies of these logs are included in Appendix C. In addition to the geophysical logging, each borehole was inspected with the downhole television camera after the aquifer test had been performed. All of the wells were structurally sound and the water was clear. Hydrostar pumps were installed in each well after the inspection was completed.

The water table in the 100-N Area was defined by a series of water-level measurements. Water-level measurements from the fall of 1985 and the winter of 1986-1987 were summarized in a report by Jensen (1987). Currently, water-level measurements are taken monthly from 38 wells around the 100-N Area.

These monthly measurements were begun in January 1988 and will continue on a monthly schedule. The water-table maps for this quarter were shown in Figures 16, 17, and 18.

Aquifer testing was conducted on each well to obtain data on the hydraulic properties of the aquifer. The aquifer testing also developed each well by pumping out all particles left in the well screen and filter pack during drilling. Each well was pumped with a submersible pump for a predetermined time. Table 21 shows the pumping time, pumping rate, and amount of drawdown. Interpretation of the data will be provided in the next quarterly report.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Quarterly sampling and analysis of the ground water around the 1324-N/NA ponds were initiated in December 1987, and the results are discussed in the following subsections.

Collection and Analysis

Sampling and analysis were conducted on four wells surrounding the 1324-N/NA ponds during December 1987 and this first quarter of 1988. Table 22 identifies the wells and sample collection schedule. The sample collection frequency will be changed from monthly to quarterly beginning in March 1988. The first quarter of monthly sample collection was performed to establish a statistical base.

Analyses performed on each sample included those for the primary drinking water standards, water-quality parameters, contamination indicators specified in 40 CFR 265.92(b) (EPA 1984), and specific dangerous waste constituents known to have been discharged to the ponds. A gamma scan (^{60}Co, ^{137}Cs, and ^{106}Ru) and beta scan are being added to the list of analyses for the June 1988 sampling. Phenols, ammonia, and hydrazine will also be added at that time. These radioactive and hazardous constituents were not discharged to these ponds in the past, but were probably discharged to other facilities at the 100-N Area. In addition, selected samples will be analyzed in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is

TABLE 21. Aquifer Testing in Wells Surrounding the 1324-N/NA Ponds

Well Number	Pumping Time, h	Pumping Rate, gal/min	Drawdown, ft
199-N-58	4.00	9.17	3.24
199-N-59	4.25	14.12	7.42
199-N-60	7.00	10.48	6.58
199-N-61	5.00	13.33	4.48

TABLE 22. Sample Collection Schedule for the 1324-N/NA Ponds

Well Number	Oct-Nov-Dec 1987	Jan-Feb-Mar 1988	Apr-May-Jun 1988	Jul-Aug-Sep 1988	Oct-Nov-Dec 1988
199-N-58	X	X X X	X	X	X
199-N-59	X	X X X	X	X	X
199-N-60	X	X X X	X	X	X
199-N-61	X	X X X	X	X	X

available. Four replicate tests for pH, conductivity, total organic halogens, and total organic carbon were added to the list of analyses in March 1988 to supply the needed information for statistical determinations required by 40 CFR 265 (EPA 1984).

Discussion of Results

All analyses from this quarter are summarized in Table 23. Table 24 contains the analytical data for constituents that were found to be above detection limits in at least one analysis. None of the wells sampled and analyzed during this quarter exceeded the EPA drinking water standards.

Quality Assurance/Quality Control

A QC plan for RCRA compliance projects was developed and accepted on December 31, 1987. The main focus of the QC plan is to ensure that analytical results reported by the primary analytical laboratory (currently UST) are of acceptable quality. Results of both internal UST and external checks are monitored by the project QC plan, and are reported monthly. Data monitored

TABLE 23. Sample Analysis Summary for the 1324-N/NA Ponds, December 1987 Through February 1988

Constituent List=Contamination Indicator Parameters

Constituent Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
088	CONDLAB	UMHO	.	12	0		700	WACS	xxx	Specific conductance, laboratory
191	CONDFLD	UMHO	1	9	0		700	WACS	xxx	Specific conductance, field
199	PHFIELD		0.1	8	0		6.5-8.5	EPAS	xxx	pH, field
207	PH-LAB		0.01	12	0		6.5-8.5	EPAS	xxx	pH, laboratory
C68	TOX	PPB	100	12	0		.			Total organic halogen
C69	TOC	PPB	1000	12	0		.			Total organic carbon

Constituent List=Drinking Water Parameters

Constituent Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Drinking Water Limits Limit	Agency	Exceeded	Full name
109	COLIFRM	MPN	2.2	10	10	***	1	EPA		Coliform bacteria
111	BETA	PCI/L	8	13	0		50	EPA		Gross beta
181	RADIUM	PCI/L	1	12	0		5	EPA		Total radium
212	ALPHA	PCI/L	4	13	0		15	EPA	xxx	Gross alpha
A06	BARIUM	PPB	6	12	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	12	12	***	10	EPA		Cadmium
A08	CHROMUM	PPB	10	12	3		50	EPA		Chromium
A10	SILVER	PPB	10	12	12	***	50	EPA		Silver
A20	ARSENIC	PPB	5	12	12	***	50	EPA		Arsenic
A21	MERCURY	PPB	0.1	12	12	***	2	EPA		Mercury
A22	SELENUM	PPB	5	12	12	***	10	EPA		Selenium
A33	ENDRIN	PPB	0.1	12	12	***	0.2	EPA		Endrin
A34	METHLOR	PPB	3	12	12	***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	12	12	***	5	EPA		Toxaphene
A36	a-BHC	PPB	0.1	12	12	***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	0.1	12	12	***	4	EPA		Beta-BHC
A38	g-BHC	PPB	0.1	12	12	***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	0.1	12	12	***	4	EPA		Delta-BHC
A51	LEADGF	PPB	5	12	12	***	50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	12	0		45000	EPA		Nitrate
C74	FLUORID	PPB	500	12	3		4000	EPA		Fluoride
H13	2,4-D	PPB	2	12	12	***	100	EPA		2,4-D [Dichlorophenoxyacetic acid]
H14	2,4,5TP	PPB	2	12	12	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	13	0		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	13	12		10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	13	12		50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	13	13	***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	13	13	***	50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	0.1	12	12	***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	13	13	***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	13	13	***	50	EPA		Lead, filtered

9 2 1 2 . 7 3 1 2 3

TABLE 23. (contd)

---------- Constituent List=Water Quality Parameters ----------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Limits Limit	Agency	Exceeded	Full name
A11	SODIUM	PPB	200	12	0	.			Sodium
A17	MANGESE	PPB	5	12	2	50	EPAS	xxx	Manganese
A19	IRON	PPB	30	12	1	300	EPAS		Iron
C73	SULFATE	PPB	500	12	0	250000	EPAS	xxx	Sulfate
C75	CHLORID	PPB	500	12	0	250000	EPAS		Chloride
H24	FSODIUM	PPB	200	13	0	.			Sodium, filtered
H29	FMANGAN	PPB	5	13	4	50	EPAS	xxx	Manganese, filtered
H31	FIRON	PPB	30	13	8	300	EPAS		Iron, filtered
H57	LPHENOL	PPB	10	12	12 ***	.			Phenol, low DL

---------- Constituent List=Site Specific and Other Parameters ----------

Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Limits Limit	Agency	Exceeded	Full name
A04	ZINC	PPB	5	12	3	5000	EPAS		Zinc
A06	CALCIUM	PPB	50	12	0	.			Calcium
A12	NICKEL	PPB	10	12	5	.			Nickel
A13	COPPER	PPB	10	12	12 ***	1300	EPAP		Copper
A14	VANADUM	PPB	5	12	12 ***	.			Vanadium
A16	ALUMNUM	PPB	150	12	8	.			Aluminum
A18	POTASUM	PPB	100	12	0	.			Potassium
A50	MAGNES	PPB	50	12	0	.			Magnesium
C76	PHOSPHA	PPB	1000	12	12 ***	.			Phosphate
C80	AMMONIU	PPB	50	1	1 ***	.			Ammonium ion
H18	FZINC	PPB	5	13	3	5000	EPAS		Zinc, filtered
H19	FCALCIU	PPB	50	13	0	.			Calcium, filtered
H25	FNICKEL	PPB	10	13	8	.			Nickel, filtered
H26	FCOPPER	PPB	10	13	13 ***	1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	13	11	.			Vanadium, filtered
H28	FALUMIN	PPB	150	13	7	.			Aluminum, filtered
H30	FPOTASS	PPB	100	13	0	.			Potassium, filtered
H32	FMAGNES	PPB	50	13	0	.			Magnesium, filtered

*** - Indicates all samples were below detection limits
xxx - Indicates that Drinking Water limits were exceeded
EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1986) National Primary Drinking Water Regulations as amended by 52 FR 25690
EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 National Secondary Drinking Water Regulations
WACS - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

TABLE 24. Constituents with at Least One Detected Value Obtained from Wells Surrounding the 1324-N/NA Liquid Waste Disposal Facility, December 1987

Well name	Collection Date	Duplicate sample number	ALPHA PCI/L 15	FALUMIN PPB .	ALUMNUM PPB .	BARIUM PPB 1000	FBARIUM PPB 1000	BETA PCI/L 50	FCADMIU PPB 10	FCALCIU PPB .	CALCIUM PPB .	CHLORID PPB 250000*
1-N-58	04DEC87		*-0.643	<150	<150	33	29	7.94	<2	43,500	41,400	5,760
	14JAN88		*4.090	<150	<150	28	29	4.82	<2	49,500	48,000	4,700
	18FEB88		*1.500	<150	<150	26	26	5.54	<2	48,700	47,700	4,330
	18FEB88	1	*0.831	<150	.	.	26	5.26	<2	47,600	.	.
1-N-59	04DEC87		*36.600	215	340	24	23	*4.05	<2	48,100	47,900	5,650
	13JAN88		*-0.059	189	391	24	24	9.82	<2	58,100	59,600	5,220
	18FEB88		*-0.981	220	290	22	23	9.46	<2	72,400	57,300	4,200
1-N-60	04DEC87		*1.190	225	274	28	26	*4.10	<2	55,000	54,000	5,720
	14JAN88		*-0.406	245	298	20	20	7.64	<2	50,700	46,900	3,530
	18FEB88		*-2.070	<150	<150	16	16	*3.73	<2	39,200	41,600	2,920
1-N-61	04DEC87		*-2.380	<150	<150	60	58	8.62	<2	95,300	81,800	3,660
	13JAN88		*-1.780	235	289	39	38	6.05	2	53,500	51,700	3,810
	18FEB88		*0.703	<150	<150	16	16	*4.00	<2	21,900	21,500	5,670

Well name	Collection Date	Duplicate sample number	FCHROMI PPB 50	CHROMUM PPB 50	CONDFLD UMHO 700*	CONDLAB UMHO 700*	FLUORID PPB 4000	IRON PPB 300*	FIRON PPB 300*	MAGNES PPB .	FMAGNES PPB .	FMANGAN PPB 50*
1-N-58	04DEC87		<10	14	1,476	146	1,390	228	<30	7,970	8,050	<5
	14JAN88		<10	<10	1,529	1,150	1,280	77	<30	9,010	9,280	<5
	18FEB88		<10	17	M	1,350	<500	73	<30	9,180	9,330	<5
	18FEB88	1	14	.	.	.	.	.	61	.	9,180	<5
1-N-59	04DEC87		<10	12	1,623	151	1,520	230	<30	11,200	10,900	189
	13JAN88		<10	<10	1,539	1,720	1,460	57	<30	13,600	13,300	216
	18FEB88		<10	<10	1,369	1,670	590	<30	<30	12,800	13,600	172
1-N-60	04DEC87		<10	15	1,552	156	1,610	100	<30	12,700	12,600	239
	14JAN88		<10	11	1,512	1,150	1,300	92	34	11,700	12,300	230
	18FEB88		<10	12	M	1,350	<500	82	31	9,020	8,680	95
1-N-61	04DEC87		<10	28	1,502	141	1,470	162	30	18,600	18,200	127
	13JAN88		<10	12	1,493	1,560	1,480	208	42	13,200	13,200	116
	18FEB88		<10	13	M	1,250	<500	84	<30	5,090	5,250	29

TABLE 24. (contd)

Well name	Collection Date	Duplicate sample number	MANGESE PPB 50*	NICKEL PPB .	FNICKEL PPB .	NITRATE PPB 45000	PH-LAB .	PHFIELD .	FPOTASS PPB .	POTASUM PPB .	RADIUM PCI/L 5	SODIUM PPB .
1-N-58	04DEC87		9	<10	<10	1,720	7.58	7.6	3,210	3,460	*-Ø.0072	272,000
	14JAN88		<5	<10	<10	1,490	7.37	5.6	3,760	3,700	*-0.0086	283,000
	18FEB88		<5	10	<10	2,260	7.20	M	3,260	3,170	0.2530	254,000
	18FEB88	1	.	.	10	.	.	.	3,130	.	.	.
1-N-59	04DEC87		186	11	10	1,580	6.47	6.2	3,580	3,970	*0.0747	335,000
	13JAN88		196	<10	10	1,890	6.59	5.6	4,010	4,320	*0.1230	307,000
	18FEB88		167	11	12	2,210	6.07	M	4,080	3,790	0.3190	351,000
1-N-60	04DEC87		246	15	12	1,590	6.27	6.1	3,640	4,050	0.1770	320,000
	14JAN88		213	11	<10	1,570	5.87	3.7	3,450	3,370	*0.0522	267,000
	18FEB88		101	10	11	2,120	5.95	M	2,840	2,920	0.2880	271,000
1-N-61	04DEC87		132	17	10	1,290	5.82	5.7	2,970	3,100	*0.0210	275,000
	13JAN88		97	<10	<10	1,610	5.64	5.1	2,510	2,580	*0.0432	295,000
	18FEB88		29	<10	<10	2,770	6.00	M	1,590	1,530	*0.1090	251,000

Well name	Collection Date	Duplicate sample number	FSODIUM PPB .	SULFATE PPB 250000*	TOC PPB .	TOX PPB .	FVANADI PPB .	ZINC PPB 5000*	FZINC PPB 5000*
1-N-58	04DEC87		301,000	666,000	1,030	#25.5	<5	8	7
	14JAN88		285,000	608,000	1,010	#8.2	<5	<5	<5
	18FEB88		250,000	679,000	#893	#12.6	5	<5	<5
	18FEB88	1	251,000	.	.	.	<5	.	<5
1-N-59	04DEC87		298,000	789,000	1,160	#18.3	5	28	28
	13JAN88		315,000	833,000	1,180	#18.8	<5	10	24
	18FEB88		361,000	904,000	#870	#14.9	<5	19	18
1-N-60	04DEC87		283,000	819,000	#999	#24.3	<5	21	13
	14JAN88		272,000	681,000	#997	#14.7	<5	11	11
	18FEB88		253,000	736,000	#987	#18.7	<5	6	5
1-N-61	04DEC87		292,000	816,000	#969	#25.3	<5	17	18
	13JAN88		280,000	792,000	#811	#13.0	<5	<5	18
	18FEB88		273,000	669,000	1,360	#23.0	<5	6	6

< - Less than Contractual Detection Limit, reported as Detection Limit
- Less than Contractual Detection Limit, actual value reported but may not be reliable
* - Less than 2-sigma counting error for radionuclides

by the QC plan include reports issued by UST, results of EPA and DOE interlaboratory comparisons, analysis of blind standards, and interlaboratory comparisons with duplicate field samples. Established PNL quality assurance procedures will be used in conjunction with the QC plan.

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REFERENCES

DOE. 1987. Environmental Survey Preliminary Report, Hanford Site, Richland, Washington. DOE/EH/OEV-05-P, Environment, Safety and Health Office of Environmental Audit, U.S. Department of Energy, Washington, D.C.

Ecology. 1986a. Consent Agreement and Compliance Order No. DE86-133. Washington State Department of Ecology, Olympia, Washington.

Ecology. 1986b. (As Amended). "Dangerous Waste Regulations." Washington Administrative Code, Chapter 173-303. Washington State Department of Ecology, Olympia, Washington.

EPA. 1984. (As amended). "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." Title 40, Code of Federal Regulations, Part 265. U.S. Environmental Protection Agency, Washington, D.C.

Jensen, E. J. 1987. Summary of Water-Level Measurements Around the 1325-N Crib During the Fall of 1985 and the Winter of 1986-1987. PNL-6374, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1986. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period May 1 to September 30, 1986. PNL-6466, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1987a. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period October 1 to December 31, 1986. Volumes 1, 2, and 3. PNL-6465, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1987b. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period January 1 to March 31, 1987. Volumes 1, 2, and 3. PNL-6467, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1987c. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period April 1 to June 30, 1987. PNL-6468, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1987d. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period July 1 to September 30, 1987. PNL-6469, Pacific Northwest Laboratory, Richland, Washington.

PNL. 1988a. Ground-Water Monitoring Compliance Projects for Hanford Site Facilities: Progress Report for the Period October 1 to December 31, 1987. PNL-6536, Pacific Northwest Laboratory, Richland, Washington.

Resource Conservation and Recovery Act of 1976. Public Law 94-580, October 21, 1976, 90 Stat. 2795, Title 42.

Weekes, D.C., S. M. Luttrell, and M. R. Fuchs. (1987). Hydrogeologic Characterization and Ground-Water Monitoring System of the Nonradioactive Dangerous Waste Landfill, Hanford Site, Washington. Westinghouse Hanford Company, Richland, Washington.

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